



**Rainsong Development Inc (Phase 2)**

**Functional Servicing & Stormwater  
Management Report**

**February 2022**

**Submitted by:**

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**Project Number: 1900T**

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## Submission History

| Submission      | Date           | In Support Of       | Distributed To                                                  |
|-----------------|----------------|---------------------|-----------------------------------------------------------------|
| 1 <sup>st</sup> | February, 2022 | Draft Plan Approval | City of Barrie, Lake Simcoe<br>Region Conservation<br>Authority |



## 1.0 Introduction

SCS Consulting Group Ltd. has been retained by Rainsong Development Inc. to prepare a Functional Servicing Report for a subject development within the Phase 2 area of the Hewitt's Secondary Plan Area (SPA) located in the City of Barrie.

### 1.1 Purpose of the Functional Servicing Report

The Functional Servicing Report has been prepared in support of Draft Plan of Subdivision for the subject development (provided in **Appendix A**). The proposed development consists of the following land uses:

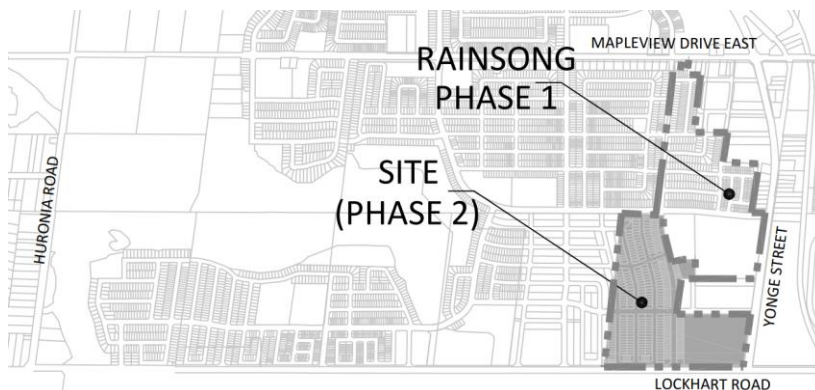
- Singles, semi-detached and townhouse residential;
- Part of a School Block and another School block; and
- Proposed municipal roads.

The purpose of this report is to demonstrate that the subject development can be graded and serviced in accordance with the City of Barrie, Lake Simcoe Region Conservation Authority (LSRCA) and the Ministry of Environment, Conservation and Parks (MECP) design criteria.

### 1.2 Study Area

The property is approximately 24.5 ha in size and is bound by Yonge Street to the east, Rainsong Phase 1 to the north, Lockhart Road to the south and agricultural lands to the west (to be developed by others under separate cover). The property is comprised of agricultural land and open space and is located within the Lover's Creek and Hewitt's Creek watersheds in the City of Barrie.

The Hewitt's SPA is to be developed in four phases. This FSR will address the 24.5 ha property located within the Phase 2 lands as illustrated on **Figure 1.1**.



**Figure 1.1 Site Location Plan**

### 1.3 Background Servicing Information

In preparation of the site servicing and storm water management (SWM) strategies, the following design guidelines and standards were used:

- ➔ Stormwater Management Policies and Design Guidelines, City of Barrie (November 2009);
- ➔ Sanitary Sewer Collection System Policies and Design Guidelines, City of Barrie (September 2012);
- ➔ Water Transmission and Distribution Policies and Design Guidelines, City of Barrie (May 2015);
- ➔ Lake Simcoe Region Conservation Authority (LSRCA) Technical Guidelines for Stormwater Management Submissions (September 2016);
- ➔ Lake Simcoe Protection Plan (July 2009);
- ➔ Lot Grading and Drainage Standards and Design Manual, City of Barrie (June 2016);
- ➔ Ministry of Environment (MECP) Stormwater Management Planning and Design Manual (March 2003); and
- ➔ Ministry of Transportation (MTO) Drainage Management Manual (1997).

The servicing and SWM strategies in this report are based on the following reports:

- ➔ Hewitt's Secondary Plan Area Subwatershed Impact Study (SIS) Lover's, Hewitt's, and Sandy Cove Creeks prepared by R.J. Burnside September 2016;
- ➔ Preliminary Geotechnical Investigation Proposed Development Property Yonge Street and Lockhart Road Innisfil, Ontario prepared by Golder Associates November 2006;
- ➔ Functional Servicing Report (Phase 1), prepared by SCS Consulting Group Ltd., April 2017;
- ➔ Engineering Drawings Set, Rainsong Development Phase 1, prepared by SCS Consulting Group Ltd., dated August 2020;
- ➔ Engineering Drawings Set, Lockmaple Subdivision, Lockmaple Innisfil Investments Ltd., prepared by Jones Consulting Group Ltd., dated January 2019; and
- ➔ Hydrogeological Study in Support of Draft Plan – Phase 2, Rainsong Land Development Inc., by RJ Burnside, dated January 2022.

Relevant excerpts from the above listed documents are included in **Appendix B**.

As required, a design charrette was completed on July 28<sup>th</sup> 2020, the design charrette revealed that the proposed development was in conformity with the SIS and City



criteria. All relevant information in the charrette has been expanded upon in this document. Note as requested, a SWM compliance letter and infrastructure summary letter were also completed, these letters and the design charrette presentation have been included in **Appendix B**.

## 2.0 Stormwater Management

### 2.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the design guidelines and previous studies listed in **Section 1.3**. The stormwater runoff criteria are summarized below in **Table 2.1**:

**Table 2-1: Stormwater Runoff Control Criteria**

| Criteria          | Control Measure                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quantity Control  | Proposed peak flow controls are to match existing peak flows for the 2 through 100 year storm events.<br>Proposed runoff volume shall be captured and infiltrated/filtered on site from a 25 mm rainfall event over the total impervious area. |
| Quality Control   | MOECC Enhanced Level Protection (80% TSS Removal).                                                                                                                                                                                             |
| Erosion Control   | Detention of the rainfall runoff volume from a 25 mm 4-hour Chicago storm for a minimum of 24 hours.                                                                                                                                           |
| Water Budget      | Maintain existing groundwater recharge rates and appropriate distribution, ensuring the protection of related hydrology ecologic functions.                                                                                                    |
| Phosphorus Budget | A best effort shall be employed such that any increase in loading is kept to a minimum. The target is “zero” increase in loading.<br>In addition, the removal of 80% of the annual Total Phosphorus load is required.                          |

### 2.2 Existing Drainage

Runoff from Catchments 101 (1.15 ha), 102 (7.73 ha), and 103 (14.38 ha) are conveyed west as overland flow through the adjacent cropland to the west ultimately discharging to Lover’s Creek. Runoff from Catchment 104 (1.22 ha) is conveyed east as overland flow to Yonge Street continuing as overland flow and ultimately discharging to Hewitt’s Creek.

An existing storm drainage plan (**Figure 2.1**) was prepared for the subject development and drainage boundaries were determined using information provided by the field survey data.

### 2.3 Best Management Practices

In accordance with the MECP Stormwater Management Planning and Design Manual (2003), a review of stormwater management (SWM) best practices was completed using



a treatment train approach, which evaluated lot level, conveyance system and end-of-pipe alternatives.

The following characteristics of the subject development were taken into consideration:

- ➔ The topography is generally flat to gently rolling with slopes ranging from 0.5% to 2.0 %. The highest elevation is generally located long the subwatershed divide between Lovers and Hewitt's Creek at an elevation of 271.6 meters above seal level (masl), where the lowest portion of the site is located in the southwest corner (~263 masl), refer to **Figure 2.1** for further detail;
- ➔ Based on the Geotechnical investigation, soils consist of sand and gravel, as well as sandy and silty glacial till;
- ➔ The monitoring well information shows groundwater observed at elevation of 261 – 264.8 masl, depths ranging between 1 m and 7 m below existing grade;
- ➔ The subject development is approximately 24.5 ha and consists of residential areas, public rights-of-way, and school blocks;
- ➔ The subject development drains to Lover's Creek and Hewitt's Creek in the existing condition with the watershed divide running along the eastern limit of the site; and
- ➔ Based on the infiltration rates calculated via the testing program set forth in the hydrogeological assessment, infiltration-based LIDs are feasible.

### 2.3.1 Lot Level Controls

Lot-level controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system. These controls are typically proposed on private properties. Incorporating controls that require minimal maintenance can be an effective method in the treatment train approach to SWM. The following lot level controls have been evaluated for use in the proposed development:

**Increased Topsoil Depth** – An increase in the restored topsoil depth on lots can be used to promote lot level infiltration and evapotranspiration. Increased topsoil depth will contribute to lot level quality and water balance control. In accordance with the SIS, a minimum depth of 0.3 m is proposed in all landscaped areas.

**Passive Landscaping/Bio-Retention** – Planting of gardens and other vegetation designed to minimize local runoff or use rainwater as a watering source can be used to reduce rainwater runoff by increasing evaporation, transpiration, and infiltration. By promoting infiltration through passive landscaping, water quality and quantity control is provided for the volume of water retained. Passive landscaping can provide significant

SWM benefits as part of the overall treatment train approach for the proposed development.

**Roof Runoff to Soak-away Pits** – Directing roof runoff to subsurface soak-away pits can be used to promote infiltration. By promoting infiltration water quality and quantity control is provided for the volume of water retained. Infiltration of roof runoff can provide a significant SWM benefits as part of the overall treatment train approach for the proposed development.

**Roof Runoff to Retention Cisterns** – Directing roof runoff to rainwater retention cisterns (i.e. rain barrels or greywater re-use) will contribute to water quality and water balance control. The retained rainwater can be harvested for re-use such as irrigation and/or greywater use. A typical rain barrels ranges in size from 190 to 400 liters. Feasibility of retention cisterns will be determined by the home builder.

**Green Roofs** – Best suited for flat roofs, green roofs provide rainwater retention in the growing medium where it is evaporated, evapotranspired, or slowly drains away after the rainfall event. The subject development will have peaked roofs within the residential portion and are thereby not suitable. Feasibility of green roofs for the school blocks is to be confirmed at the site plan application stage.

**Rooftop and/or Parking Lot Detention Storage** – Often employed with large rooftop or parking lot footprints, flow attenuation for quantity or extended detention control can be provided via a flow restriction with stormwater storage provided via ponding either on rooftops or parking lots. The subject development does not have any flat rooftops or parking lots, within its residential portion therefore this is not suitable. Feasibility of rooftop and parking lot storage for the school blocks is to be confirmed at the site plan application stage.

**Roof overflow to Grassed Areas** – Directing roof leaders to grassed areas will contribute to water quality and water balance control by encouraging stormwater retention. Roof leaders can be directed to grassed areas where there is grass, however, if there is limited or no grass (i.e. street townhouses), roof leaders should be connected to the storm sewer to eliminate the hazard of ice accumulation. It is recommended to direct roof leaders to the front or rear yards where possible to promote infiltration and to avoid discharging to impervious areas directly connected to the storm sewer per City of Barrie guidelines.

**Pervious Pavement** – By encouraging infiltration and filtration, pervious pavement within the proposed driveways can contribute to water quality, balance and erosion control. Due to excessive cost and potential maintenance access issues, permeable pavers are not recommended for the residential portion of the site. Feasibility of



permeable pavers for the school and recreation centre blocks is to be confirmed at the site plan application stage.

**Vegetated Filter Strip** – At source filtration and infiltration may be encouraged through the use of vegetated filter strips by directing sheet flow from impermeable areas to the strip prior to being collected via the storm system. Vegetated filter strips are best suited to parking lot areas with landscaped borders or islands or within buffer areas. There are none of these areas on the residential portion of the subject development, therefore vegetated filter strips are not suitable. The potential use of vegetated filter strips in the recreation centre and school blocks will be evaluated at the site plan application stage.

A summary of the suitability of lot level controls for the site is provided in **Table 2.2**.

### **2.3.2 Conveyance Controls**

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility and present opportunities to distribute stormwater management techniques throughout a development. The following conveyance controls have been evaluated for use in the proposed development:

**Grassed Swales** – A grassed swale will promote infiltration, filtration, and evapotranspiration, contributing to water quality and quantity control. Grassed swales need an unimpeded and relatively wide stretch of landscaped area, such as within a wide boulevard with no driveways, to function properly. There are no areas on the residential portion of the subject development for conveyance level grassed swales therefore grassed swales are not suitable. It is noted that smaller grassed swales will potentially be used at the individual lot grading level. Feasibility of grassed swales for the school blocks will be confirmed at the site plan application stage.

**Bioretention** – To meet LSRCA criteria for water balance, bioswales/rain gardens are feasible for non-frontage boulevards. A portion of the required water balance volume for the residential portion of the subject development could be accommodated in the rain gardens.

**Exfiltration at Rear Lot Catchbasins** – Where rear lot catchbasins are required due to grading constraints, a perforated pipe system could be incorporated into the rear lot catchbasin design to promote infiltration of ‘clean’ stormwater runoff. By promoting infiltration, water quality and quantity control is provided for the volume of water retained. Infiltration can provide significant SWM benefits as part of the overall treatment train approach for the subject development.

**Street Catchbasin Exfiltration System** – Within the proposed 18 m and 24 m municipal ROWs, street catchbasin exfiltration systems could be incorporated to provide water



quality and quantity control by promoting infiltration. Catchbasins would be fitted with a deep sump and pre-treatment device (Goss Trap, CB Shield, etc.) to prevent floatables and sediment from entering the exfiltration trench.

A summary of the suitability of potential conveyance controls for the subject development is provided in **Table 2.2**.

### **2.3.3 End-of-Pipe Controls**

Stormwater management facilities at the end of pipe receive stormwater flows from a conveyance system and provide treatment of stormwater prior to discharging flows to the receiving outlet. While lot level and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the proposed development. The following end of pipe controls have been evaluated for use in the proposed development:

**Stormwater Detention Facility** – To meet quantity erosion control targets, flow restrictors can be used to control stormwater release rates. To accommodate the reduced release rate, stormwater detention facilities are required to store stormwater runoff. Stormwater storage can be provided by oversized storm sewers and controlled with flow restrictors prior to discharging to the receiving infrastructure. As quantity control will be provided by downstream SWM facilities additional stormwater detention facilities are not required.

**Infiltration Gallery** – To meet infiltration and retention target, an end-of-pipe infiltration gallery can be used to accommodate requirements in an area noted to have favourable soils and low groundwater. The neighbouring development to the west (Mattamy Lockhart Development) has identified the park area on the east side of the site (immediately west of Rainsong Phase 2) to be an ideal location for an infiltration facility that will service the Rainsong Phase 2 lands.

**Wet Ponds, Wetlands, Dry Ponds** – Sized in accordance with the MOECC criteria, these end of pipe facilities can provide water quality, quantity, and erosion control treatment. As outlined in the SIS, wet ponds are proposed to provide water quality, quantity, and erosion control treatment for the subject development.

**Manufactured Treatment Device** – A properly sized manufactured treatment device (MTD) can assist in providing MECP Enhanced (Level 1) treatment and can contribute to the treatment train approach for water quality control. The MTD unit specified (Jellyfish JF4-2-1 unit) is Environmental Technology Verification (ETV) certified, to provide 80% TSS removal. Therefore, at-source and conveyance controls will work in conjunction with the MTD unit to provide overall Enhanced quality control. It is noted that as quality control will be provided by proposed LIDs and downstream wet ponds, OGS units are



not recommended in the residential portion of the development. The feasibility of incorporating OGS units into the school blocks will be determined at the site plan application stage.

#### 2.3.4 Selection of Best Management Practices

**Table 2.2** summarizes the suitability of the various stormwater management controls identified for the proposed development.

**Table 2-2: Recommended Stormwater BMP's**

| Stormwater Management Practice               | Feasible (Yes/No)      | Recommended (Yes/No)   |
|----------------------------------------------|------------------------|------------------------|
| Reduced Lot Grading                          | Yes                    | Yes                    |
| Increased Topsoil Depth                      | Yes                    | Yes                    |
| Passive Landscaping/Bio-Retention            | Yes                    | Yes                    |
| Roof Leader to Soak-away Pits                | Yes                    | No                     |
| Roof Runoff to Retention Cisterns            | Yes                    | Yes                    |
| Green Roofs                                  | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |
| Rooftop and/or Parking Lot Detention Storage | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |
| Roof overflow to Grassed Areas               | Yes                    | Yes                    |
| Pervious Pavement                            | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |
| Vegetated Filter Strips                      | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |
| Grassed Swales                               | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |
| Bioretention                                 | Yes                    | Yes                    |
| Rear Lot Catchbasins Exfiltration            | Yes                    | No                     |
| Street Catchbasin Exfiltration System        | Yes                    | No                     |
| Stormwater Detention Facility                | Yes                    | No                     |
| Infiltration Facility                        | Yes                    | Yes                    |
| Wet Ponds, Wetlands, Dry Ponds               | Yes                    | Yes                    |
| Manufactured Treatment Device                | Yes (Site Plan Blocks) | Yes (Site Plan Blocks) |



At the detailed design stage, a water balance evaluation will be incorporated into the detailed stormwater management report that discusses the selection of LIDs and quantifies the proposed rainwater retention volume.

## **2.4 Proposed Storm Drainage**

The storm drainage for the subject development is split between sub-catchments of three (3) different stormwater management facilities (SWMF) as identified in the SIS, each facility will be discussed below.

### **2.4.1 Drainage to SWMF #3**

As illustrated on **Figure 2.2**, runoff from Catchment 202 & 203 (12.39 ha & 4.73 ha respectively) will be conveyed west via the proposed storm sewer and ROWs to the adjacent property to the west (Mattamy Lockhart). Runoff will ultimately be conveyed through the adjacent property to SWMF #3 as outlined in the SIS. As shown in the SIS, SWMF #3 outlets to Lover's Creek.

### **2.4.2 Drainage to SWMF #4**

As illustrated on **Figure 2.2**, runoff from Catchment 201 (3.10 ha) will be conveyed northwest via the proposed storm sewer and rights-of-way (ROWs). To the adjacent property to the north (Rainsong Phase 1) and subsequently the property to the northwest (Lockmaple Phase 1). The runoff will ultimately be conveyed through the adjacent properties to a stormwater management facility (SWMF #4) as outlined in the downstream SWM Report, FSR and SIS. SWMF #4 outlets to Lover's Creek.

### **2.4.3 Drainage to SWMF #5**

As illustrated on **Figure 2.2**, runoff from Catchment 204 (3.16 ha) will be captured via a proposed 100-year storm sewer and conveyed east across Yonge Street to the adjacent property to the east (Ballymore). Runoff will ultimately be conveyed to SWMF #5. SWMF #5 outlets to Hewitt's Creek.

Changes in contributing drainage areas to SWMFs will be resolved through future coordination with adjacent land owners and SWMF designs.

Note that the institutional block (Block 278) in the Phase 2 lands will be developed with the northern elementary school block (Catchment 301, 2.94 ha). The school is proposed to be serviced through the northern Phase 1 infrastructure; this approach was approved in the Rainsong Phase 1 Draft Plan Application.



## **2.5 Proposed Stormwater Management Plan**

### **2.5.1 Quantity Control**

As outlined in the SIS, quantity control will be provided via SWMF #3, SWMF #4, and SWMF #5 with proposed peak flows matching existing peak flows for the 2 through 100 year storm events. Changes in contributing drainage areas to SWMFs will be resolved through future coordination with adjacent land owners to ensure quantity control requirements are met by the proposed downstream SWM facilities.

### **2.5.2 Quality Control: TSS**

As outlined in the SIS, the permanent pool of SWMF #3, 4 & 5 will provide 80% TSS removal per MECP criteria. In addition, the LID's that will potentially be implemented will provide a treatment train approach. As the LID's are not required for quality control purposes they have not been accounted for as such in the preliminary calculations included in **Appendix C**.

### **2.5.3 Quality Control: Phosphorus**

Under the Lake Simcoe Protection Plan, a stormwater management plan must demonstrate how phosphorus loadings are minimized between existing and proposed. Furthermore, the Lake Simcoe Phosphorus Offsetting Policy (September 2017) states that:

*"The phosphorous load from the proposed development on the property will be zero. In situations where the phosphorous load cannot be met or demonstrated in a post-development scenario to achieve the Zero Phosphorous, the developer or proponent shall be required to provide phosphorous offsetting to the LSRCA."*

The MECP database application Lake Simcoe Phosphorus Loading Development Tool (v2, 01-April-2012 update) was used to complete the phosphorus budget for the proposed development. Due to the complex treatment train provided by the SWM measures outlined above a spreadsheet based on the MECP database application was developed to determine the proposed conditions phosphorus budget.

#### **2.5.3.1 Existing Phosphorus Loadings**

The existing phosphorus loading was calculated based on the existing land use interpreted from satellite imagery. The existing land use consists of 16.0 ha of cropland distributed between the Hewitt's Creek and Lover's Creek Watersheds with annual phosphorus loading coefficients of 0.19 kg/ha and 0.16 kg/ha respectively. Refer to **Appendix C** for the phosphorus loading tool output.



### 2.5.3.2 Proposed Phosphorus Loadings

A preliminary concept illustrating potential LID's and the contributing drainage areas are shown on **Figure 2.4**. The single-family residential lots are considered high intensity development according to the STEP LID TTT (v1.2.1), and the school block are considered high intensity development – commercial/industrial. The proposed phosphorus loading with no best management practices (BMPs) was calculated to be 34.46 kg/yr (refer to **Appendix C**).

The proposed phosphorus loading with the potential BMPs outlined in **Section 2.6** below was calculated to be 2.48 kg/yr (see **Appendix C**). **Table 2.3** provides a summary of the land use, BMP, and phosphorus removal efficiencies for the proposed condition.

**Table 2-3: Phosphorus Budget Summary**

| Existing Phosphorus Loading (kg/yr) | Proposed Phosphorus Loading without BMPs (kg/yr) | Proposed Phosphorus Loading with BMPs (kg/yr) |
|-------------------------------------|--------------------------------------------------|-----------------------------------------------|
| 3.99                                | 34.46                                            | 2.48                                          |

As per LSRCA's Phosphorus Offsetting Policy, the increase in phosphorus loading will be offset at a rate of \$35,770/kg/year, at a 2.5:1 ratio. The cost of the phosphorous offsetting will be calculated at the detailed design stage based on final on-site and downstream treatment design.

### 2.5.4 Erosion Control

The erosion control criterion is to provide a minimum of 24 hour extended detention of the runoff from a 25 mm rainfall event and will be provided in SWMF #3, 4 & 5. Further discussion of the preliminary design requirements of the proposed SWM facilities are available in the applicable downstream FSR's and the SIS.

### 2.5.5 Water Budget

As outlined in the following, **Section 2.6**, LID measures, such as centralized infiltration galleries, rain gardens and catchbasin exfiltration trenches have the potential to be implemented, where feasible, to maintain or increase existing infiltration rates. As the preliminary total infiltration volume of 8,268 m<sup>3</sup> within the potential LIDs is the equivalent of 45 mm of rainfall over impervious areas it is assumed that the existing infiltration volumes will be achieved on an annual basis.

As noted in the Hydrogeological Assessment (RJ Burnside, December 2021), the estimated existing annual infiltration volume on the proposed development is



approximately 58,200 m<sup>3</sup>. Without mitigation the proposed development annual infiltration volume is approximately 17,800 m<sup>3</sup>.

As recommended in the Hydrogeological Study, low impact development measures, including the Mattamy Lockhart Lands Infiltration Facility will be implemented, where feasible, to maintain or increase existing infiltration rates. It is anticipated that a proposed annual infiltration volume exceeding the required 40,400 m<sup>3</sup> can be achieved through the proposed mitigation measures.

## 2.6 Low Impact Development

As detailed in the SIS, the residential portion of the subject development has been divided into three (3) drainage areas based on the three (3) unique receiving SWMFs with corresponding infiltration and filtration targets established on the basis of infiltration rate and LSRCA guidelines. The majority of the site lies in Catchment 3 which is proposed to drain to SWMF #3 to the west for which the recommended infiltration target and filtration targets are “best efforts” and 25 mm respectively. The remainder of the site is split between Catchment 4 and Catchment 5. The northern area falls in Catchment 4 which is proposed to drain to SWMF #4 to the northwest, similar to SWMF #3, the recommended infiltration target and filtration targets are “best efforts” and 25 mm respectively. The eastern half of the school block site lies in Catchment 5 which is proposed to drain to SWMF #5 to the east for which the recommended infiltration and filtration targets are 5 mm and 20 mm respectively.

It is noted that the hydrogeological information referenced in the SIS to establish infiltration targets is based on limited borehole and monitoring well data, since then a hydrogeological assessment has been conducted within the subject development confirming soils adequate for infiltration and groundwater levels that permit subsurface infiltration in certain areas. Accordingly, as shown in the calculations included in **Appendix C**, best efforts were made to achieve the infiltration target for the residential portion of the subject development.

As detailed in **Section 2.6.1** and **Section 2.6.2** below, potential LIDs have been explored as to maximize infiltration as a best efforts approach. Based on preliminary calculations included in **Appendix C**, it is anticipated that with sufficient infiltration rates the potential LIDs will provide an infiltration/filtration volume of 8,268 m<sup>3</sup> which is equivalent to a depth of 45 mm over impervious areas exceeding the criteria established in the SIS. In-situ testing will be performed prior to detailed design to confirm infiltration rates.

Design of LIDs for the school blocks will be developed at the site plan application stage and are required to infiltrate/filtrate 25 mm over all impervious areas for the northern

institutional school block and 20mm fall impervious areas for the southern institutional school block.

### **2.6.1 Centralized Infiltration Facility**

The centralized infiltration gallery is preliminarily sized as a 1m deep infiltration facility with a footprint area of ~7,800m<sup>2</sup>, as this area exceeds the requirements for the subject site, further refinement of the design of this facility is to occur through coordination of the consultants at the detailed design stage.

### **2.6.2 Rain Gardens**

Raingardens are feasible within non-frontage boulevards including the east side of the Street R ROW and around the southern loop of the proposed Street T ROW. Curb cuts would be proposed to be located upstream of regular street catchbasins to collect and convey low flows to the rain gardens. When the runoff enters the rain garden, it would filter through an engineered soil media sized to achieve water balance targets. An underdrain, located at the bottom of the rain garden would collect the filtered water and convey the water to the proposed storm sewer. A preliminary detail of the potential rain garden layout within the 18 m and 24 m ROWs are shown on **Figure 2.5**, and **Figure 2.6**, respectively.

The proposed bioswale/rain garden will collect runoff from half of the road right-of-way via proposed curb cuts to facilitate retention and filtration via the proposed engineered soil media and stone base. The curb cuts are proposed along the length of the respective bioswale to maximize conveyed drainage area. Curb cuts are proposed upstream of catchbasins to ensure runoff is conveyed to the bioswale prior to discharging to the proposed storm sewers. In storm events where the capacity of the bioswale is exceeded, runoff will discharge back to the road where it will be captured by catchbasins located immediately downstream of the lowest curb cut.

## **2.7 Storm Servicing**

The storm sewer system (minor system) will be designed for the 5 year return storm per City of Barrie standards.

The major system drainage (up to the 100 year storm event) will generally be conveyed overland along the proposed ROW's. Per the City of Barrie standards, flow depth on roads shall not exceed 0.20 m above the crown of the road.

The storm sewer system will typically be designed with grades between 0.5% and 2%. Throughout the proposed development, the storm sewer will be constructed at a minimum depth of 1.5 m to provide frost protection and 3.0 m where basement connections are required. The preliminary layout for the proposed storm sewer within





the subject lands is provided on **Figure 2.3**. The storm sewer system will be designed in accordance with the Municipality and MOECC guidelines, including the following:

- ➔ Pipes to be sized to accommodate runoff from a 5 year storm event,
- ➔ Minimum Pipe Slope 0.5 %
- ➔ Maximum Flow Velocity: 4.0 m/s,
- ➔ Minimum Flow Velocity: 0.75 m/s,
- ➔ Minimum Pipe Depth: 1.5 m to obvert, 3.0 m where basement connections are required.

The rainfall intensity will be calculated using A, B, and C values per **Table 2.4**:

**Table 2-4: Rainfall Intensity Parameters**

| Return Period Storm | A        | B     | C     |
|---------------------|----------|-------|-------|
| 2 Year              | 678.085  | 4.699 | 0.781 |
| 5 Year              | 853.608  | 4.699 | 0.766 |
| 10 Year             | 975.865  | 4.699 | 0.760 |
| 25 Year             | 1146.275 | 4.922 | 0.757 |
| 50 Year             | 1236.152 | 4.699 | 0.751 |
| 100 Year            | 1426.408 | 5.273 | 0.759 |

## 2.8 Overland Flow

Major system flows (greater than the 5 year up to the 100 year storm event) will be conveyed within the ROW's to the proposed outlet locations. As shown on **Figure 2.2**, four (4) overland flow routes are proposed to convey flows from the subject development to the adjacent properties to the north and west and subsequently to the proposed downstream SWMF #4 & 3 respectively. The proposed overland flow route on the southwest side of the subject development provides sufficient capacity to convey overland flow to the adjacent property. Overland flow capacity calculations are provided in **Appendix C**.

As shown on **Figure 2.2**, 100 year capture points are proposed throughout the subject development. Sizing of 100 year capture catchbasins will be provided at detailed design.

The school block (Catchment 204) is to provide 100 year capture on site. Detailed design of the 100 year capture will be provided at the site plan application stage. Accordingly, the connection provided on Street B is to be sized for the 100 year storm event.



### 3.0 Sanitary Servicing

#### 3.1 Existing Sanitary Sewer System

The existing sanitary sewers adjacent to the subject development at the anticipated time of construction include; a 200 mm diameter PVC stub extending 29.7m south from MH29A through the northern limit of the Phase 2 property along Moberly Drive from Rainsong Phase 1, along with three (3) connection points to the neighbouring Mattamy Lockhart Development to the west on Street 'O', Street 'B', and the servicing easement in the southwest corner of the Rainsong Phase 2 Lands.

An overview of existing sanitary infrastructure adjacent to the Hewitt's SPA is summarized in the SIS. Excerpts relevant to the subject development are included in **Appendix B**.

#### 3.2 Proposed Sanitary Sewer System

As outlined in the SIS, the subject development will be serviced via connection points to the western and northern sanitary sewers.

Sanitary flows from the northern portion of the subject development in addition to flows from adjacent land owners to the west will be serviced by an existing 450 mm sewer located at Patrick Drive and Seline Crescent (connection point E3 in the SIS). The subject development will contribute sanitary drainage to this connection point from a total of 467 residential units over an area of 18.08 ha. Additional institutional flows will come from the recreation centre block using a total area of 0.52 ha.

Sanitary flows from southern school block in addition to flows from adjacent land owners to the east will be serviced by an existing 825mm pipe located in an easement north of at Maplevue Drive East and west of Sun King Crescent (connection point E5 in the SIS). These lands will contribute 5.87 ha of institutional flows.

Sanitary servicing for the elementary school block (Block 278) in the Phase 2 lands will be developed with the northern elementary school block. The school is proposed to be serviced through the northern Phase 1 infrastructure; this approach was noted through the Rainsong Phase 1 Draft Plan Application.

The preliminary layout for the proposed sanitary sewers within the subject development is provided on **Figure 2.3**.

The sanitary sewer system will be designed in accordance with the City of Barrie and MECP criteria, including but not limited to:

●→ Residential Sanitary Generation Rate: 225 L/cap/d;



- ➔ Population Density: 3.13 cap/unit (Single & Semi-Detached);
- ➔ Population Density: 2.34 cap/unit (Street Townhouses);
- ➔ Institutional/Commercial Demand 35 m<sup>3</sup>/ha;
- ➔ Design capacity: maximum 85% full flow;
- ➔ Peaking Factor: Harmon (2-4);
- ➔ Infiltration Rate: 0.1 L/s/ha;
- ➔ Minimum Pipe Size: 200 mm;
- ➔ Minimum Pipe Cover: 2.5 m;
- ➔ Minimum Actual Velocity: 0.60 m/s; and
- ➔ Maximum Velocity: 3.0 m/s.

## 4.0 Water Supply and Distribution

### 4.1 Existing Water Distribution

The Rainsong Phase 2 Development is to come online after the completion of the Phase 1 lands identified in the Hewitt's SIS. The watermain assumed to be in place for the development are:

- 300 mm watermain from Phase 1 on Moberly Drive (Rainsong Phase 1);
- 300 mm watermain on Madelaine Drive from the development northwest of Rainsong Phase 2 (Lockmaple Subdivision);
- 400 mm watermain along the pedestrian pathway between Thicketwood Avenue and Patrick Drive.

### 4.2 Proposed Water System

The subject development is to be serviced as outlined in the SIS. A watermain analysis confirming the existing and planned external infrastructure has adequate capacity to service the subject site was completed by MES (January 2022) and is included in **Appendix D**. The preliminary layout for the proposed watermain system is provided on **Figure 4.1**.

The watermain system will be designed in accordance with the City of Barrie and MOECC criteria including:

- Residential water usage rate: 225 L/s;
- Population Density: 3.25 cap/unit (Single & Semi-Detached);
- Population Density: 2.57 cap/unit (Street Townhouses);
- Schools: 28 m<sup>3</sup>/ha/day;
- Minimum Pipe Size: 150 mm diameter;
- Minimum Pipe Depth: 1.7 m, and
- Maximum Hydrant Spacing: 90 m.

## 5.0 Grading

### 5.1 Existing Grading Conditions

As illustrated on **Figure 2.1**, in the existing conditions, the majority of the subject development (Catchments 101, 102 & 103) slope west towards to Lover's Creek. The remainder of the subject site (Catchment 104 (1.22 ha)) generally slopes east towards Yonge Street and Hewitt's Creek.

The topography is generally flat to gently rolling with slopes ranging from 0.5% to 4.75 %. The ground elevations through the subject development range from 271 masl to 263 masl, with the highest elevation generally located long the subwatershed divide between Lovers and Hewitt's Creek and the lowest portion of the site located in the southwest corner. Refer to **Figure 2.1**.

### 5.2 Proposed Grading Concept

In general, the proposed development will be graded in a manner which will satisfy the following goals:

- ➔ Satisfy the Municipality lot and road grading criteria including:
  - Minimum Road Grade: 0.5%
  - Maximum Road Grade: 8.0%
  - Minimum Lot Grade: 2%
  - Maximum Lot Grade: 5%
- ➔ Provide continuous road grades for overland flow conveyance;
- ➔ Minimize the need for retaining walls;
- ➔ Minimize the volume of earth to be moved and minimize cut/fill differential;
- ➔ Minimize the need for rear lot catchbasins; and
- ➔ Achieve the SWM objectives required for the subject development.

A preliminary grading plan is provided on **Figure 5.1**.

At the detailed design stage, the preliminary grading shown on **Figure 5.1** will be subject to a more in-depth analysis in an attempt to balance the cut and fill volumes and minimize slopes.

## 6.0 Rights-of-Way and Sidewalks

The majority of the subject development is comprised of 18 m ROWs for which cross-sections will be in accordance with the City of Barrie Standard Drawing BSD-301 (**Appendix E**). For Street 'A' & Street 'B', a 24 m right-of-way is proposed, the cross sections are in accordance with City of Barrie Standard Drawing BSD -303. The detailed cross-section drawings illustrating each ROW and the potential LID measures are provided in **Figure 2.5** and **2.6** accordingly.

The proposed sidewalk location plan is provided on **Figure 6.1**. For the areas where sidewalk will be provided along one side of the street, sidewalks will typically be located on south or east side of the boulevard or the boulevard side where the larger number of frontages can be serviced.

## **7.0 Cost Sharing**

The cost of infrastructure which benefits multiple properties, such as trunk storm sewers, trunk sanitary sewers, sanitary pumping stations, watermains, collector roads, and stormwater management facilities, should be shared by the benefiting landowners. It is our understanding that the landowners within the Hewitt's Creek Secondary Plan (including Rainsong Development) have established a cost sharing agreement that sets out the principles in which these costs can be equitably shared, Rainsong Development Ltd is currently in good standing in this group.



## **8.0 Erosion and Sediment Control During Construction**

During the detailed design stage, erosion and sediment control measures will be designed with a focus on erosion control practices (such as stabilization, track walking, staged earthworks, etc.) as well as sediment controls (such as fencing, mud mats, catchbasin sediment control devices, rock check dams and temporary sediment control ponds). These measures will be designed and constructed as per the “Erosion and Sediment Control Guide for Urban Construction” document (TRCA, 2019).

A detailed erosion and sediment control plan will be prepared for review and approval by the Municipality and Conservation Authority prior to any proposed grading being undertaken. This plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses and properties are minimized both during and following construction.



## **9.0 Utility Considerations**

There are currently no utilities in the immediate vicinity of the subject lands. The Hewitt's SPA is generally un-serviced open land requiring utilities to be constructed to facilitate development of the residential, commercial, and employment land uses. Utility providers have been contacted with respect to their existing infrastructure in the area surrounding the Hewitt's SPA. The information below has been gathered through coordinating with utility providers by George Todd Consulting. Note that as the Phase 1 property is the northern neighbour of this Phase 2 property it is anticipated that all services will be available at the time of the Phase 2 development.

### **9.1 Hydro**

It has been determined that InnPower plans to service the area and Hydro One plans to ensure there is sufficient transmission capacity to accommodate the proposed growth in Barrie and Innisfil.

### **9.2 Gas**

Enbridge Gas Distribution has confirmed they are aware of the proposed development and are undertaking a review of gas supply and infrastructure for both upgrading and main extensions.

### **9.3 Bell**

Bell has plans to provide service and are awaiting details for the developments.

### **9.4 Cable**

Rogers has plans to provide service and are awaiting details for the developments.

Coordination with the utility providers will occur at the detailed design stage.

## 10.0 Summary

This Functional Servicing Report has been prepared in support of the Draft Plan of Subdivision application for the proposed Rainsong Phase 2, 24.5 ha development in the City of Barrie. This report outlines the means by which the subject development can be graded and serviced in accordance with the City of Barrie, Lake Simcoe Region Conservation Authority, Lake Simcoe Protection Plan, MTO, and the Ministry of Environment and Climate Change design criteria and policies.

### General Information

- The existing land use is cropland;
- The subject development is located in the Hewitt's Creek and Lover's Creek subwatersheds in the Lake Simcoe Watershed; and
- The proposed development consists of:
  - Single, semi-detached and townhouse residential;
  - School Blocks; and
  - Municipal ROWs.

### Stormwater Management and Storm Servicing

- Quality Control: MECP Enhanced (Level 1) water quality protection can be provided through the use of downstream stormwater management facilities (wet ponds) as outlined in the SIS;
- Erosion Control: The runoff volume from a 25 mm rainfall event will be detained over 24 hours by the downstream SWM facilities as outlined in the SIS;
- Quantity Control: Quantity control will be provided via downstream SWM facilities as outlined in the R.J. Burnside SIS for the 2 through 100 year storm events;
- Water Budget: The maintenance of the annual water budget is achieved via proposed LID measures across the subject site and neighbouring development, a detailed water budget analysis was completed by RJ Burnside and is available under separate cover;
- Phosphorus Budget: A phosphorus budget analysis was completed using the MOECC phosphorus budget tool, which shows that the proposed phosphorus export will be less than existing;
- Storm Servicing:
  - Storm runoff will be conveyed by storm sewers designed in accordance with City of Barrie and MECP criteria;
  - Storm sewers will generally be designed for the 5 year storm event; and
  - Adequate 100 year overland flow routes will be provided.



### **Sanitary Servicing**

- Sanitary servicing is to be provided for the subject development via connection points E3 and E5 per the SIS.

### **Water Supply and Distribution**

- Water servicing is proposed to be provided in accordance with the SIS; and
- MES Consulting Group has completed a watermain hydraulic analysis to show that there is sufficient domestic and fire flows to service the development.

### **Grading**

- The preliminary site grading has been developed to match to the existing surrounding grades in addition to the proposed grades of adjacent sites within the Hewitt's SPA, and provide conveyance of stormwater runoff, including external drainage; and
- The preliminary lot grading will be subject to further grading design at the detailed design stage

### **Rights-of-Way and Sidewalks**

- The ROWs within the subject development are comprised of 18 m & 24 m rights-of-way, cross-sections are in accordance with the City of Barrie Standard Drawings BSD-301 & 303 respectively; and
- Sidewalks will typically be located on south or east side of the boulevard or the boulevard side where the larger number of frontages can be serviced when not proposed on both sides of the street.

### **Cost-Sharing**

- The cost of infrastructure which benefits multiple properties is to be shared equitably by the landowners within the Hewitt's Creek Secondary Plan (including Rainsong Land Development Inc.).

### **Erosion and Sediment Control during Construction**

- An erosion and sediment control plan will be prepared at the detailed engineering stage, in accordance with the "Erosion and Sediment Control Guide for Urban Construction" (TRCA, December 2019).



### Utility Considerations

- ➔ There are currently no utilities in the immediate vicinity of the subject lands. The Hewitt's SPA is generally un-serviced open land requiring utilities to be constructed to facilitate development of the residential, commercial, and employment land uses. Utility providers have been contacted with respect to their existing infrastructure in the area surrounding the Hewitt's SPA.

Respectfully Submitted:

**SCS Consulting Group Ltd.**

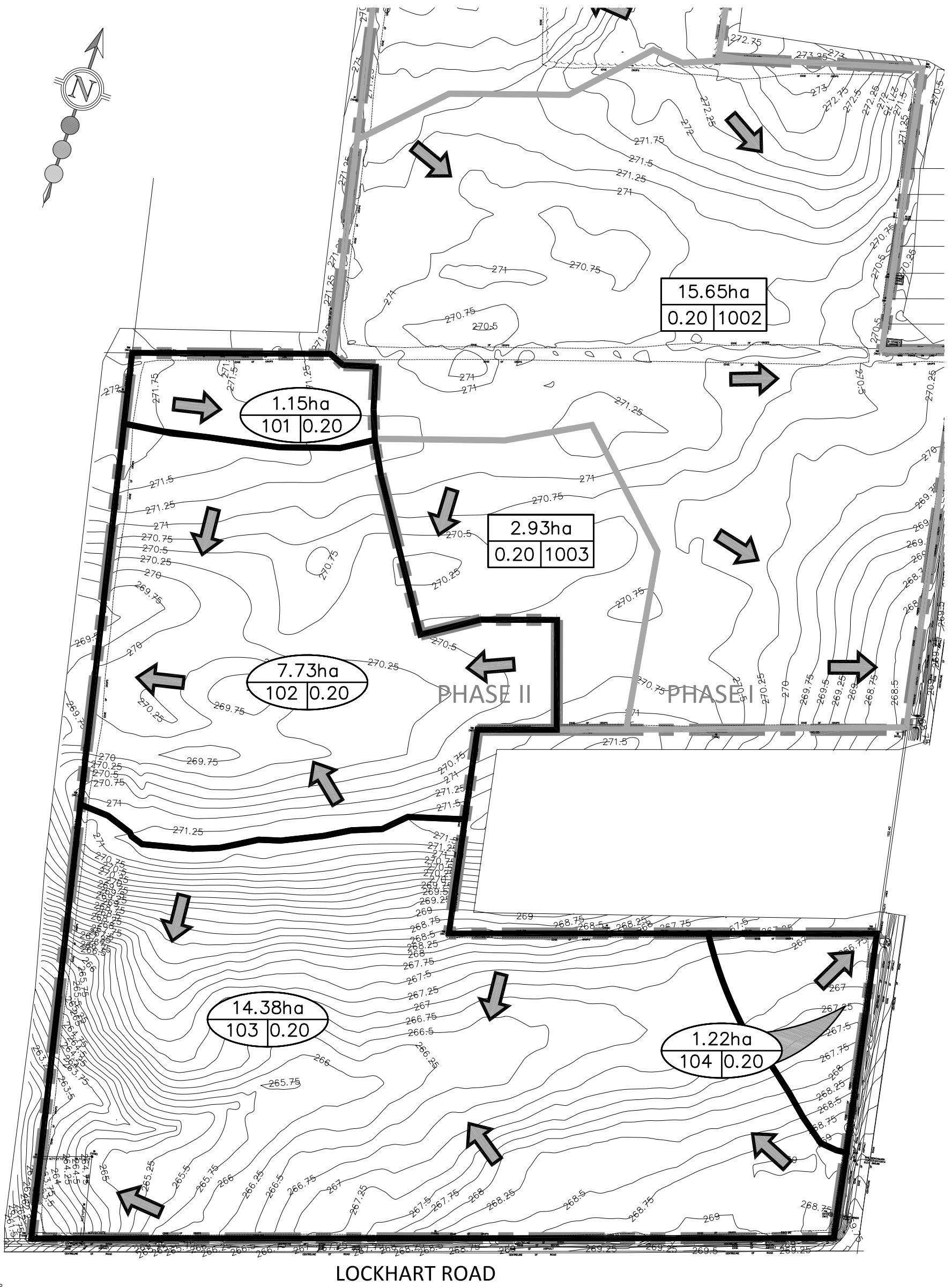


Michael Ventresca, P. Eng.,  
mventresca@scsconsultinggroup.com



John Priamo, P. Eng.  
jpriamo@scsconsultinggroup.com

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**LEGEND:**

LIMIT OF DEVELOPMENT

PHASE 1 PROPERTY BOUNDARY

STORM DRAINAGE BOUNDARY

OVERLAND FLOW DIRECTION

0.04ha  
104 | 0.20

DRAINAGE AREA (HECTARES)

RUNOFF COEFFICIENT

CATCHMENT ID

270.25

EXISTING CONTOUR AND ELEVATION

AREA

ID | C

EXTERNAL STORM DRAINAGE AREA (HECTARES)

RUNOFF COEFFICIENT

CATCHMENT ID

EXTERNAL STORM DRAINAGE BOUNDARY

RAINSONG DEVELOPMENT -  
BARRIE PHASE 2

30 CENTURIAN DRIVE, SUITE 100  
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TEL: (905) 475-1900  
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DESIGNED BY: M.G.V.

CHECKED BY: J.M.P.

SCALE: 1:3000

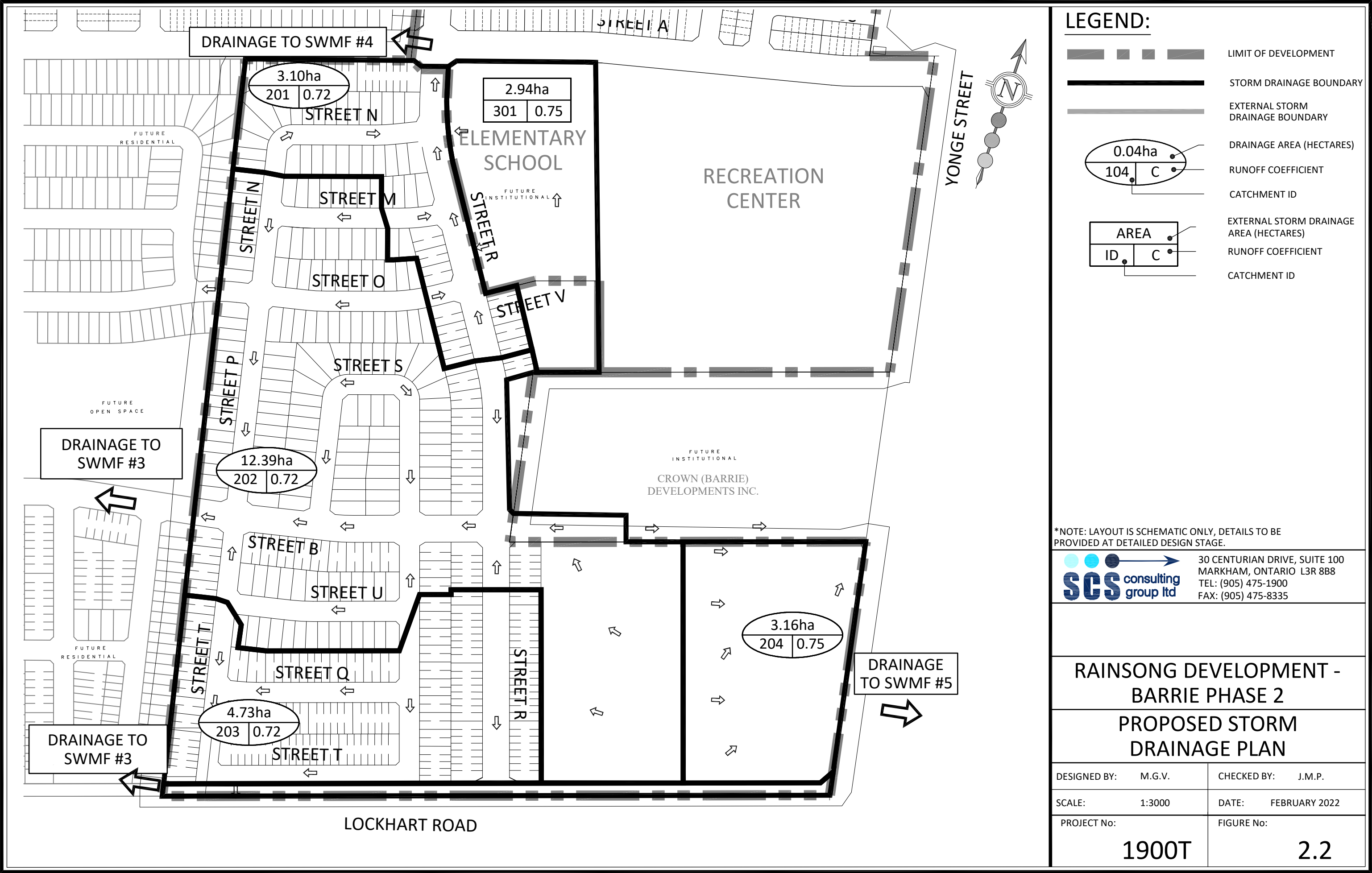
DATE: FEBRUARY 2022

EXISTING STORM DRAINAGE  
PLAN

PROJECT No:  
1900T

FIGURE No:  
2.1

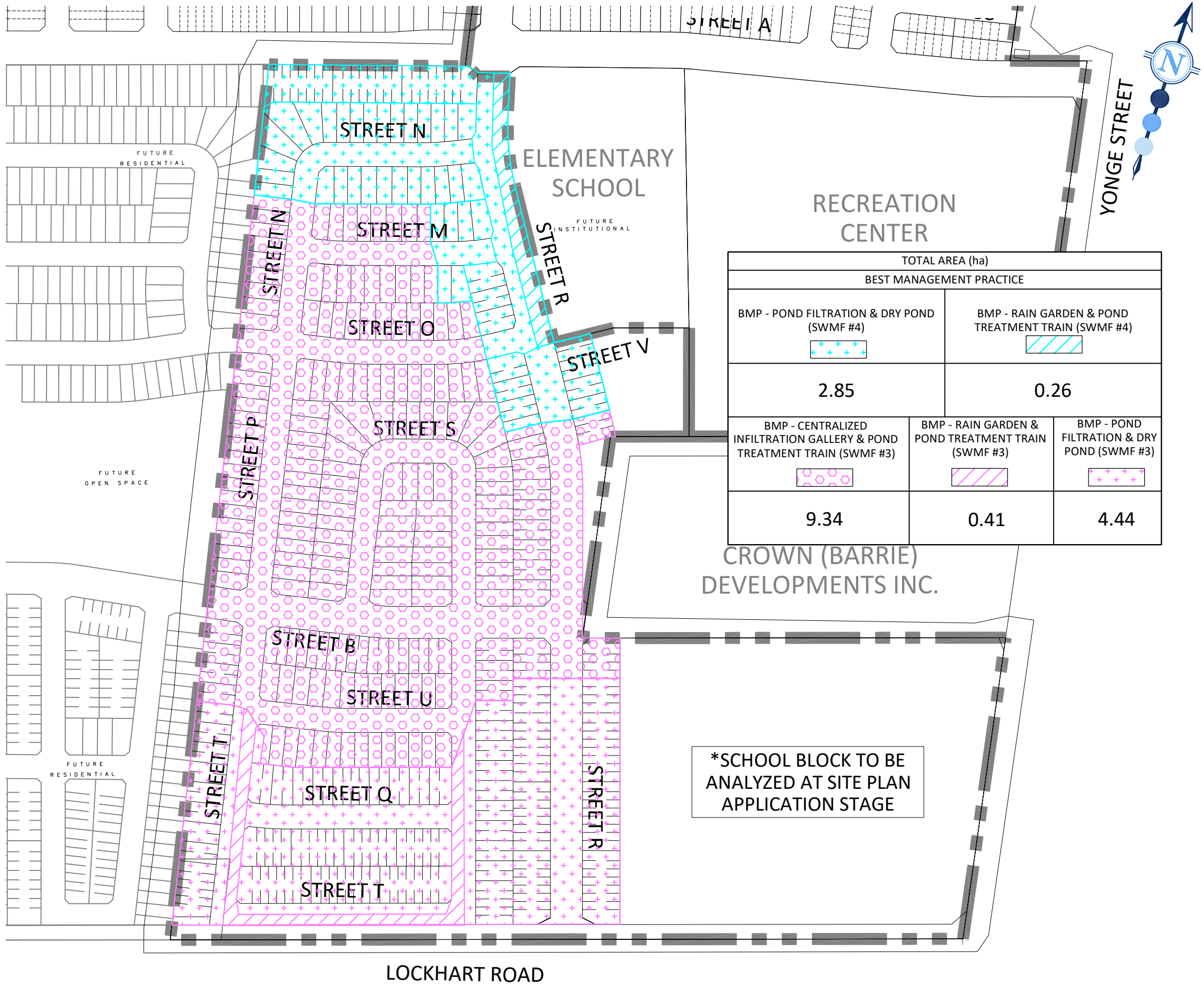
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LEGEND:

- LIMIT OF DEVELOPMENT
- BMP - POND FILTRATION & DRY POND (SWMF #4)
- BMP - RAIN GARDEN & POND TREATMENT TRAIN (SWMF #4)
- BMP - CENTRALIZED INFILTRATION GALLERY & POND TREATMENT TRAIN (SWMF #3)
- BMP - POND FILTRATION & DRY POND (SWMF #3)
- BMP - RAIN GARDEN & POND TREATMENT TRAIN (SWMF #3)

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

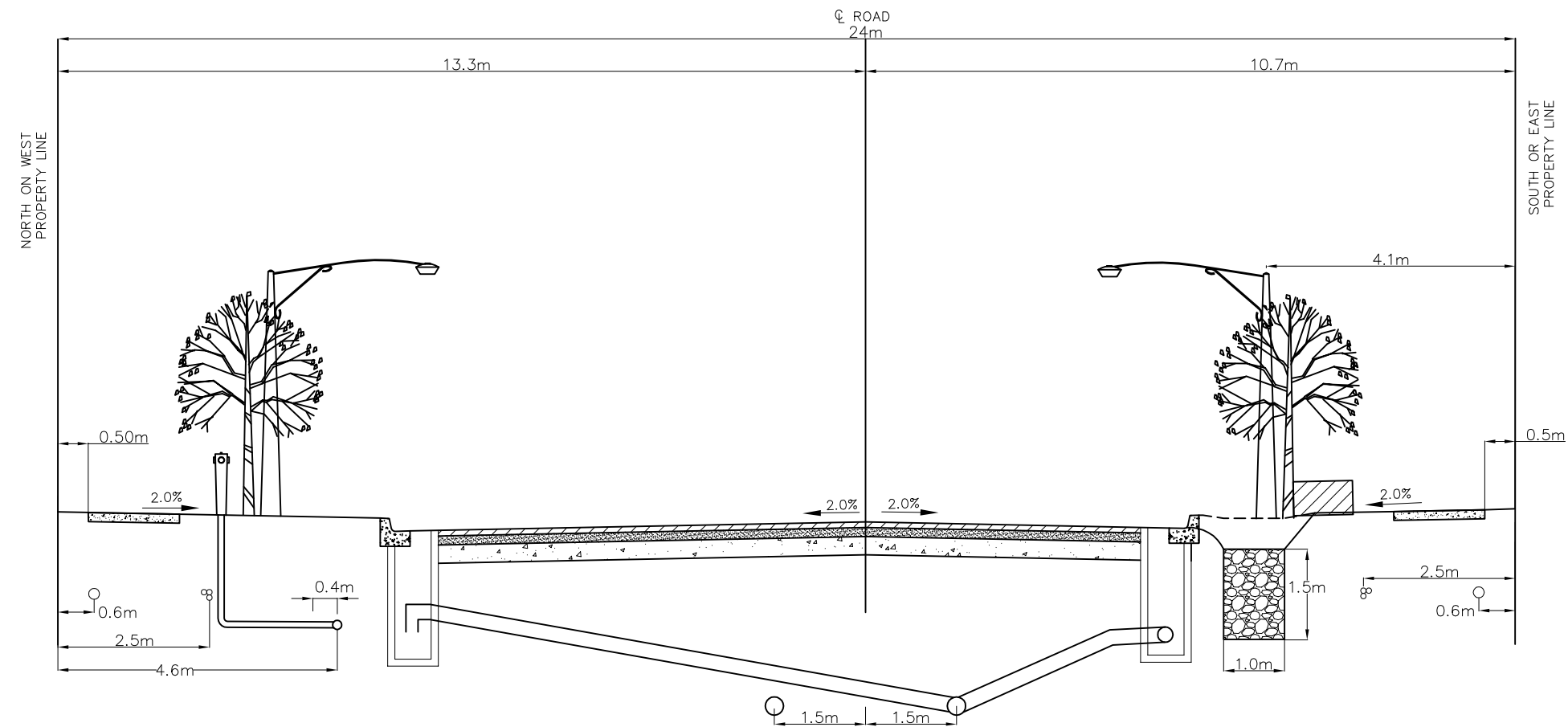


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RAINSONG DEVELOPMENT -  
BARRIE PHASE 2  
PROPOSED PHOSPHORUS  
BUDGET PLAN

|              |        |             |               |
|--------------|--------|-------------|---------------|
| DESIGNED BY: | M.G.V. | CHECKED BY: | J.M.P.        |
| SCALE:       | 1:3000 | DATE:       | FEBRUARY 2022 |
| PROJECT No:  | 1900T  | FIGURE No:  | 2.4           |





GAS MAIN  
 JOINT UTILITY TRENCH —  
 (HYDRO, BELL, CABLE, GAS)  
 HYDRANT  
 STREETLIGHTS,  
 PEDESTAL, TREES  
 WATERMAIN  
 DEEP SUMP CATCHBASIN WITH  
 PRETREATMENT DEVICE —  
 (i.e: GOSSTRAP)

SANITARY SEWER  
 CENTRE LINE  
 STORM SEWER

DEEP SUMP CATCHBASIN WITH  
 PRETREATMENT DEVICE —  
 (i.e: GOSSTRAP)  
 RAIN GARDEN  
 TRANSFORMER  
 JOINT UTILITY TRENCH  
 SIDEWALK  
 GAS MAIN

## LEGEND:

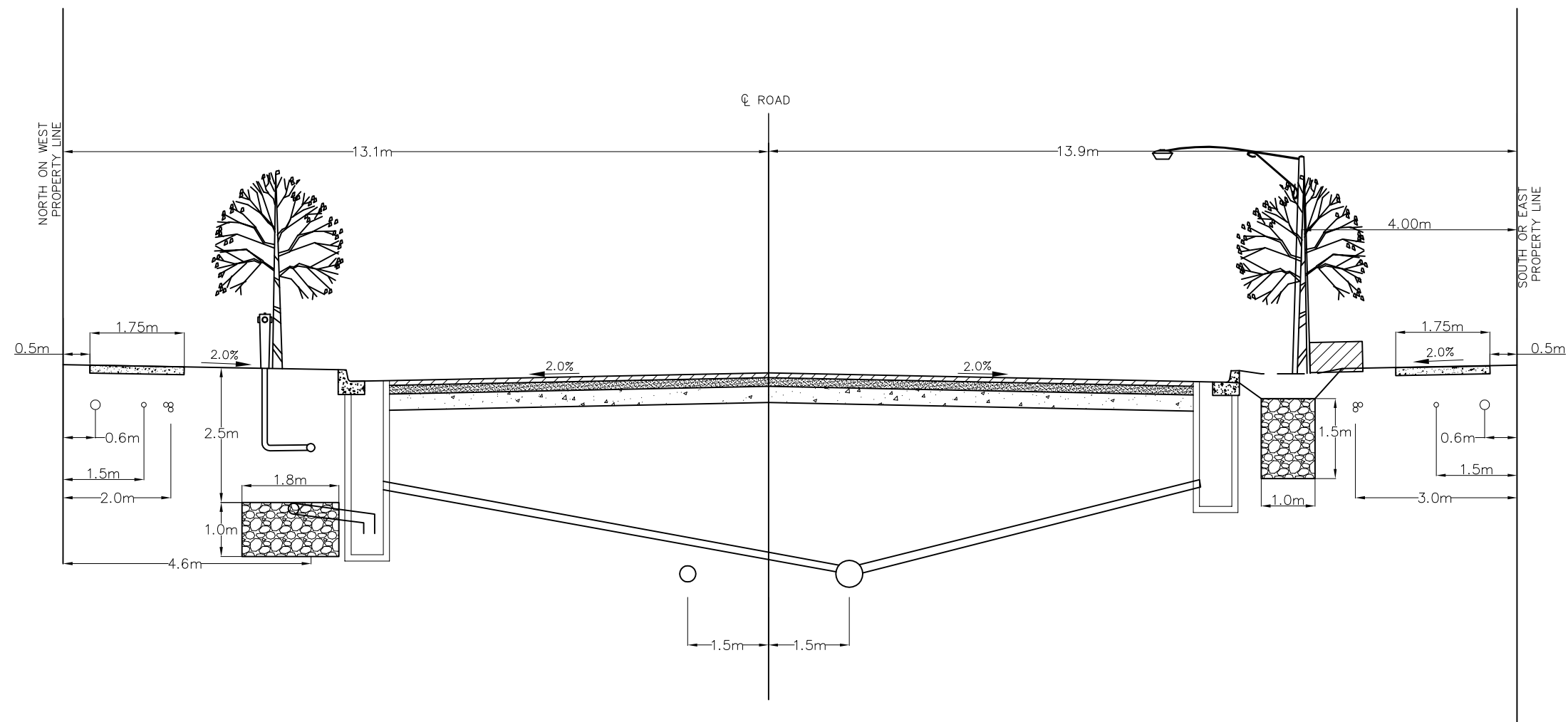
\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.



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## RAINSONG DEVELOPMENT - BARRIE PHASE 2 PRELIMINARY RAIN GARDEN LAYOUT IN 24m R.O.W.

|                             |                          |
|-----------------------------|--------------------------|
| DESIGNED BY: M.G.V.         | CHECKED BY: J.M.P.       |
| SCALE: 1:100                | DATE: FEBRUARY 2022      |
| PROJECT No:<br><b>1900T</b> | FIGURE No:<br><b>2.5</b> |



## LEGEND:

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.



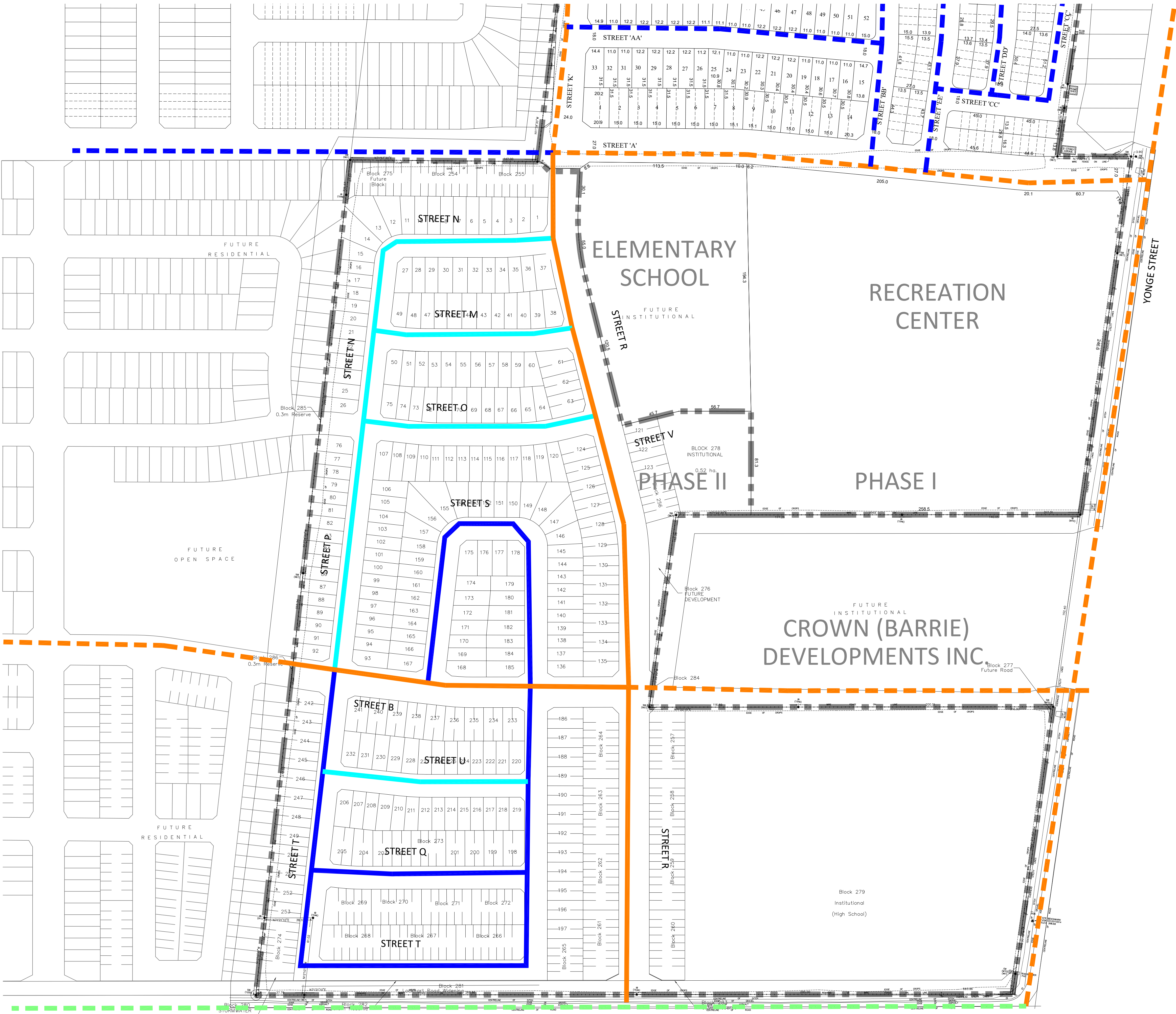
30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
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FAX: (905) 475-8335

## RAINSONG DEVELOPMENT - BARRIE PHASE 2

### PRELIMINARY RAIN GARDEN LAYOUT IN 27m R.O.W.

|              |        |             |               |
|--------------|--------|-------------|---------------|
| DESIGNED BY: | M.G.V. | CHECKED BY: | J.M.P.        |
| SCALE:       | 1:100  | DATE:       | FEBRUARY 2022 |
| PROJECT No:  | 1900T  | FIGURE No:  | 2.6           |





LEGEND:

LIMIT OF DEVELOPMENT

PROPOSED 1500 WATERMAIN

PROPOSED 2000 WATERMAIN

PROPOSED 3000 WATERMAIN

PROPOSED 4000 WATERMAIN

EXTERNAL 1500 WATERMAIN

EXTERNAL 2000 WATERMAIN

EXTERNAL 3000 WATERMAIN

EXTERNAL 4000 WATERMAIN

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

scs consulting group ltd

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RAINSONG DEVELOPMENT - BARRIE PHASE 2

WATER DISTRIBUTION SYSTEM PLAN

|              |        |             |               |
|--------------|--------|-------------|---------------|
| DESIGNED BY: | M.G.V. | CHECKED BY: | J.M.P.        |
| SCALE:       | 1:1500 | DATE:       | FEBRUARY 2022 |
| PROJECT No:  | 1900T  | FIGURE No:  | 4.1           |

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**LEGEND:**

- LIMIT OF DEVELOPMENT
- x 223.91 PROPOSED ELEVATION
- x 224.35EX EXISTING ELEVATION
- x 112.75SW SWALE ELEVATION
- ROAD ELEVATION
- 0.5% ROAD SLOPE
- LIMIT OF DEVELOPMENT

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

**scs consulting group ltd**

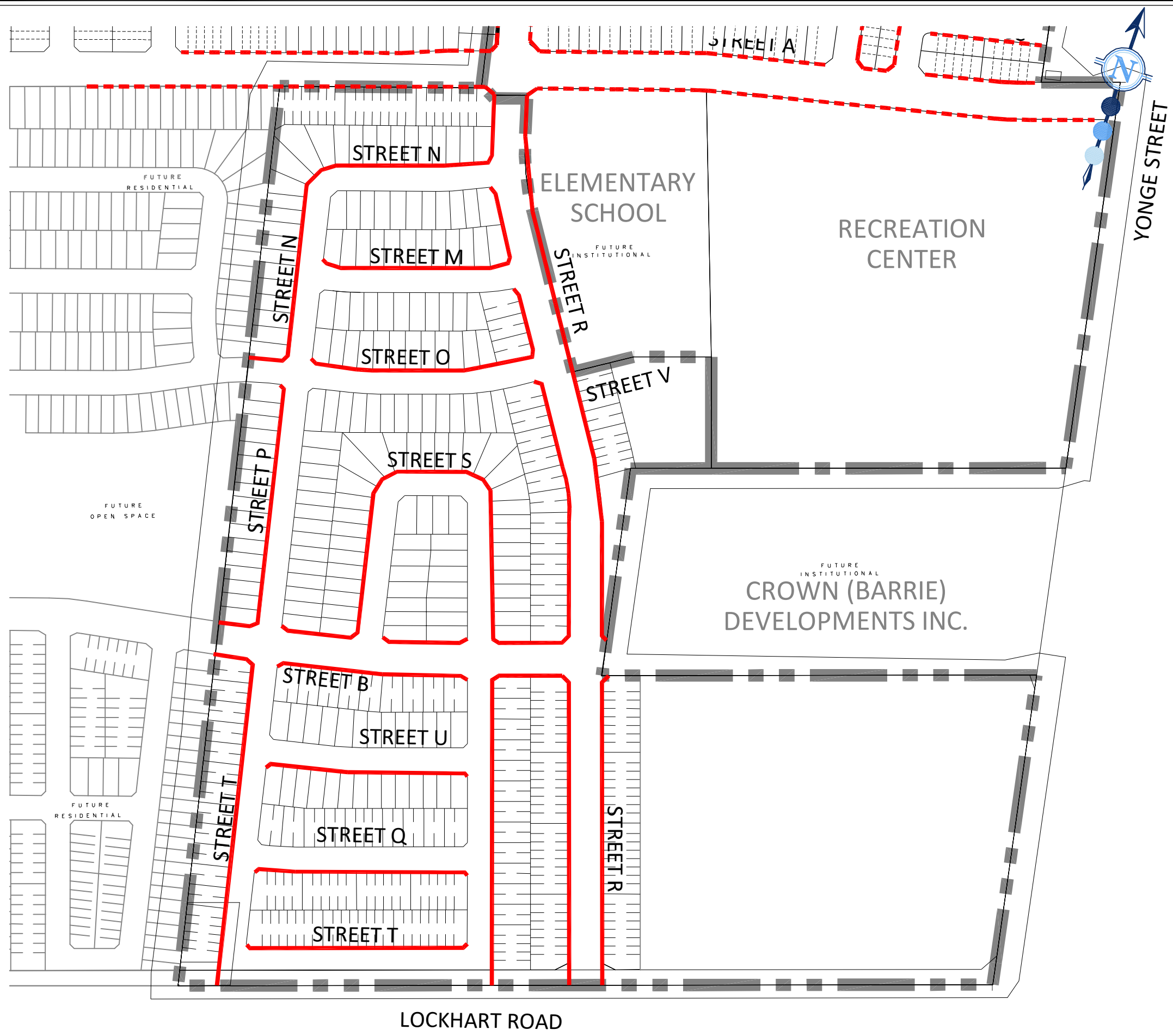
30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335

**RAINSONG DEVELOPMENT - BARRIE PHASE 2**

**PRELIMINARY GRADING PLAN**

|                     |                     |
|---------------------|---------------------|
| DESIGNED BY: M.G.V. | CHECKED BY: J.M.P.  |
| SCALE: 1:1500       | DATE: FEBRUARY 2022 |
| PROJECT No: 1900T   | FIGURE No: 5.1      |





LEGEND:

-  LIMIT OF DEVELOPMENT
-  SIDEWALK
-  EXTERNAL SIDEWALK

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.



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RAINSONG DEVELOPMENT -  
BARRIE PHASE 2

SIDEWALK LOCATION PLAN

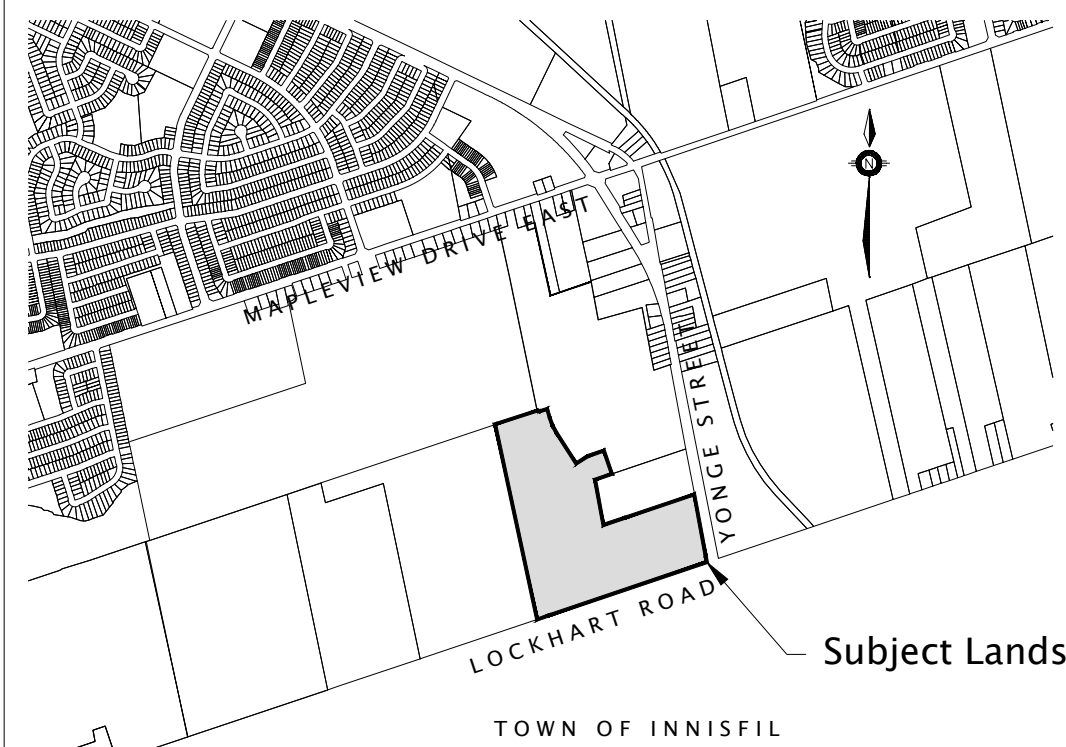
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| SCALE:       | 1:3000 | DATE:       | FEBRUARY 2022 |
| PROJECT No:  | 1900T  | FIGURE No:  | 6.1           |

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## **Appendix A      Draft Plan**

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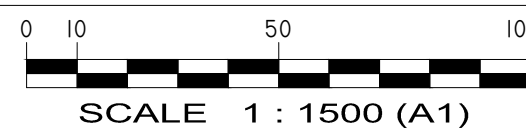


**Draft Plan of Subdivision**  
Part of Lot 15, Concession 11  
Geographic Township of Innisfil,  
**City of Barrie**  
**County of Simcoe**  
2022

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------|--------------------|------------------------|---------------------------------------------|----------------------|------------------------|--------------------------------------------------|---------------------------------------------|------------------------|----------------------------------------------------------------------------------|------------------------|--|------------------------|--|
| DATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RUDY MAK, O.L.S.V<br>RUDY MAK SURVEYING LTD.                                     |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| <p>ADDITIONAL INFORMATION REQUIRED UNDER<br/>SECTION 5(1) (7) OF THE PLANNING ACT</p> <table border="0"> <tr> <td>a) SHOWN ON DRAFT PLAN</td><td>h) MUNICIPAL WATER</td></tr> <tr> <td>b) SHOWN ON DRAFT PLAN</td><td>i) TIOGA LOAMY SAND &amp;<br/>BONHEAD SANDY LOAM</td></tr> <tr> <td>c) SHOWN ON KEY PLAN</td><td>j) SHOWN ON DRAFT PLAN</td></tr> <tr> <td>d) RESIDENTIAL, INSTITUTIONAL,<br/>&amp; SWM DRAINAGE</td><td>k) ALL MUNICIPAL SERVICES<br/>TO BE PROVIDED</td></tr> <tr> <td>e) SHOWN ON DRAFT PLAN</td><td>l) THERE ARE NO RESTRICTIVE<br/>COVENANTS AFFECTING THE<br/>LAND TO BE SUBDIVIDED.</td></tr> <tr> <td>f) SHOWN ON DRAFT PLAN</td><td></td></tr> <tr> <td>g) SHOWN ON DRAFT PLAN</td><td></td></tr> </table> |                                                                                  | a) SHOWN ON DRAFT PLAN | h) MUNICIPAL WATER | b) SHOWN ON DRAFT PLAN | i) TIOGA LOAMY SAND &<br>BONHEAD SANDY LOAM | c) SHOWN ON KEY PLAN | j) SHOWN ON DRAFT PLAN | d) RESIDENTIAL, INSTITUTIONAL,<br>& SWM DRAINAGE | k) ALL MUNICIPAL SERVICES<br>TO BE PROVIDED | e) SHOWN ON DRAFT PLAN | l) THERE ARE NO RESTRICTIVE<br>COVENANTS AFFECTING THE<br>LAND TO BE SUBDIVIDED. | f) SHOWN ON DRAFT PLAN |  | g) SHOWN ON DRAFT PLAN |  |
| a) SHOWN ON DRAFT PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | h) MUNICIPAL WATER                                                               |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| b) SHOWN ON DRAFT PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | i) TIOGA LOAMY SAND &<br>BONHEAD SANDY LOAM                                      |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| c) SHOWN ON KEY PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | j) SHOWN ON DRAFT PLAN                                                           |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| d) RESIDENTIAL, INSTITUTIONAL,<br>& SWM DRAINAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | k) ALL MUNICIPAL SERVICES<br>TO BE PROVIDED                                      |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| e) SHOWN ON DRAFT PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | l) THERE ARE NO RESTRICTIVE<br>COVENANTS AFFECTING THE<br>LAND TO BE SUBDIVIDED. |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| f) SHOWN ON DRAFT PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |
| g) SHOWN ON DRAFT PLAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |                        |                    |                        |                                             |                      |                        |                                                  |                                             |                        |                                                                                  |                        |  |                        |  |

| STATISTICS                                                                                                                                                                                                    | Area (ha.) | Units     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|
| <b>11.6m Singles</b><br>(Lots 1, 21 - 25, 30 - 32, 37 & 38, 43 - 45, 49 & 50, 54 - 56, 69 - 71, 75 & 76, 105 - 107, 136, 167 & 168, 171 - 182, 185, 206, 209, 219 & 220, & 228 - 232)                         | 1.75 ha.   | 52        |
| <b>10.1m Corner Singles</b><br>(Lots 2 - 20, 26 - 29, 33 - 36, 39 - 42, 46 - 48, 51 - 53, 57 - 60, 64 - 68, 72 - 74, 77 - 104, 108 - 120, 137 - 166, 169 & 170, 183 & 184, 207 & 208, 210 - 216, & 221 - 227) | 4.32 ha.   | 142       |
| <b>15.0m Semi Detached</b><br>(7.5m/unit)<br>(Blocks 61 - 63, 121 - 135, 186 - 205, & 233 - 253)                                                                                                              | 2.55 ha.   | 118       |
| <b>Street Townhomes</b><br>(6.1m/unit)<br>(Blocks 254 - 274)                                                                                                                                                  | 2.75 ha.   | 147       |
| <b>Future Block</b><br>(Blocks 275)                                                                                                                                                                           | 0.14 ha.   | 8         |
| <b>Future Development/Road</b><br>(Blocks 276 & 277)                                                                                                                                                          | 0.15 ha.   |           |
| <b>Institutional (School)</b><br>(Blocks 278 & 279)                                                                                                                                                           | 6.39 ha.   |           |
| <b>Stormwater Management Drainage</b><br>(Block 280)                                                                                                                                                          | 0.01 ha.   |           |
| <b>Road Widening / 0.3m Reserves</b><br>(Blocks 281 - 286)                                                                                                                                                    | 0.67 ha.   |           |
| <b>Roads &amp; Lanes</b><br>(24.0m Minor Collector (Street 'A' & 'B')<br>(18.0m Local Streets (Streets 'C' - 'I'))                                                                                            | 5.74 ha.   |           |
|                                                                                                                                                                                                               | 24.47 ha.  | 467 units |

PHASE 2  
DRAFT PLAN OF SUBDIVISION



|               |                         |
|---------------|-------------------------|
| Date Issued:  | JAN. 20, 2022           |
| Checked By:   | RD                      |
| Project No.:  | RAI-15186               |
| Drawn By:     | m.c.r.                  |
| Drawing Name: | RAI-15186-PH-2-DP-4.dwg |



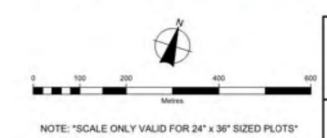
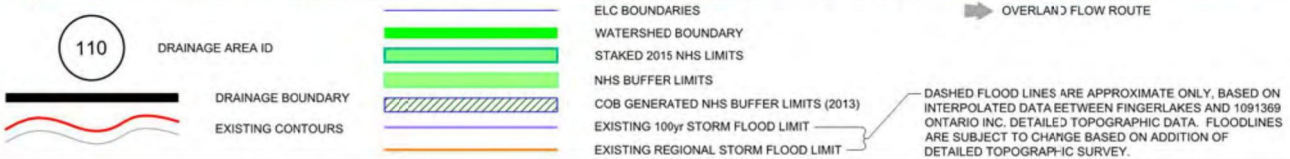
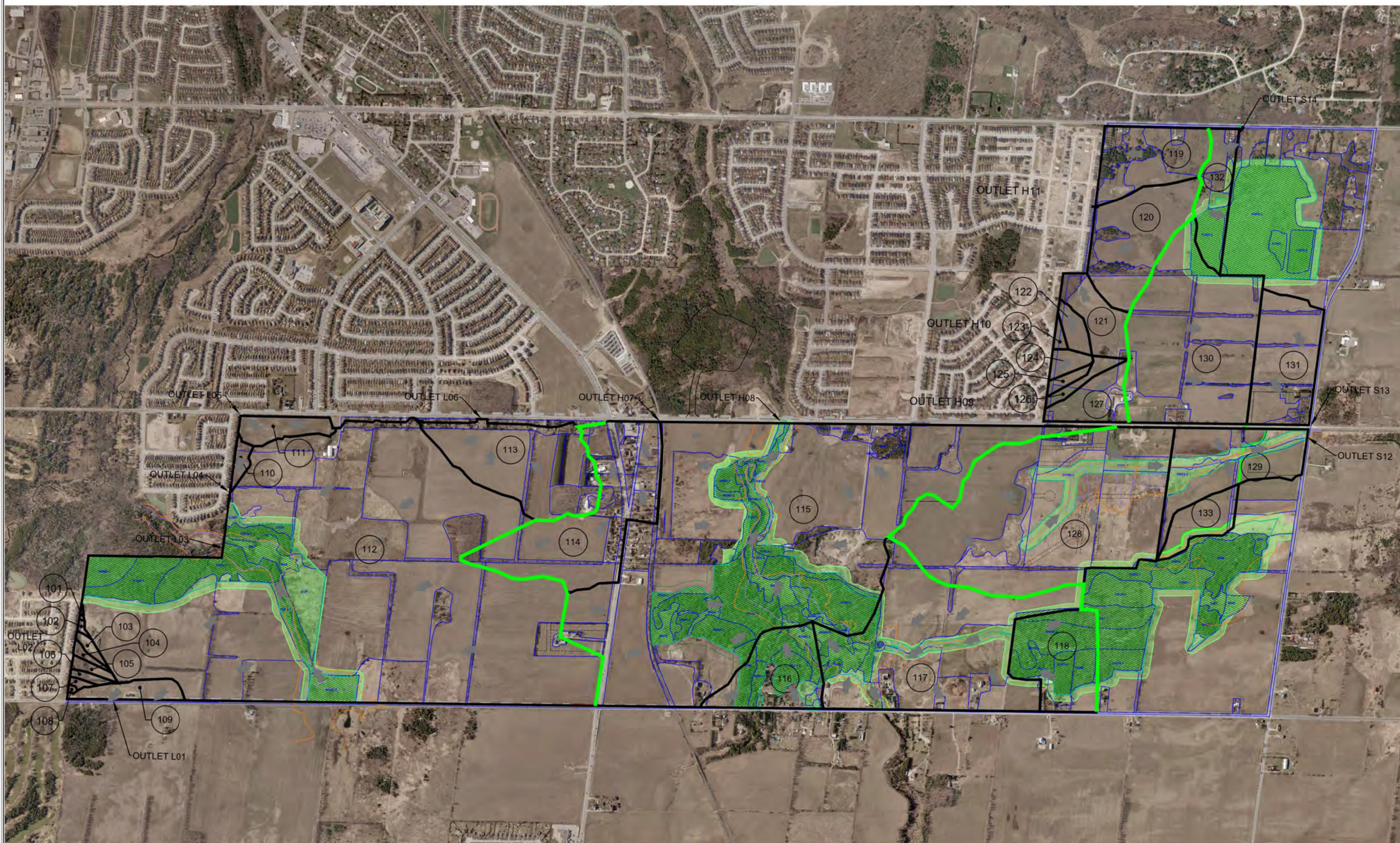
| SCHEDULE OF REVISIONS |             |       |
|-----------------------|-------------|-------|
| DATE                  | DESCRIPTION | DRAWN |
|                       |             |       |
|                       |             |       |
|                       |             |       |

---

## **Appendix B      Background Information – Relevant Report Excerpts**

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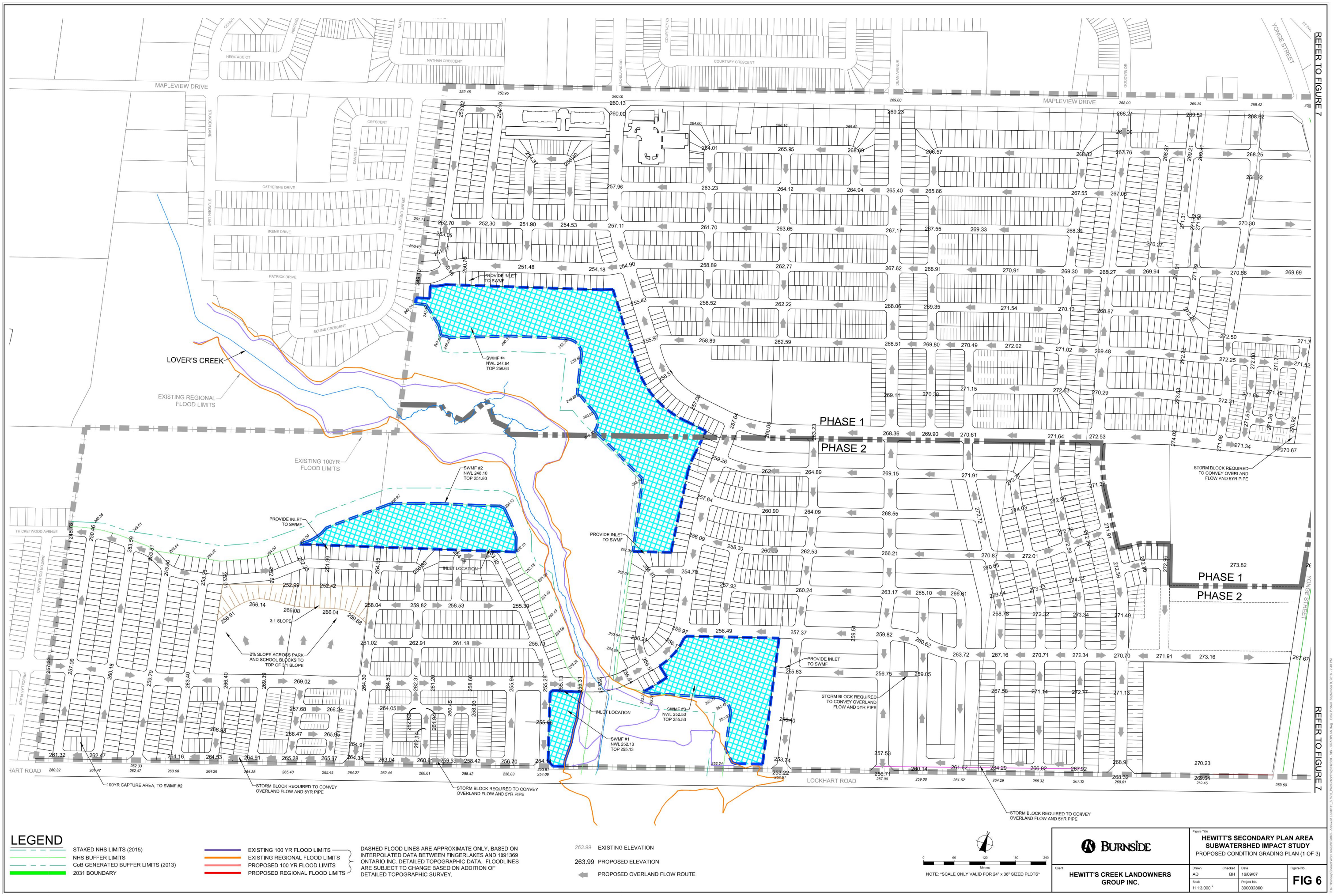


|                                              |                                                                             |                                                                                                         |                         |
|----------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------|
|                                              |                                                                             | <b>HEWITT'S SECONDARY PLAN AREA<br/>SUBWATERSHED IMPACT STUDY<br/>EXISTING CONDITIONS DRAINAGE PLAN</b> |                         |
|                                              |                                                                             | Client: <b>HEWITT'S CREEK LANDOWNERS<br/>GROUP INC.</b>                                                 | Figure No: <b>FIG 5</b> |
| Drawn: <b>BH</b><br>Scale: <b>H 1:7,500"</b> | Checked: <b>MZ</b><br>Date: <b>16/09/07</b><br>Project No: <b>300032860</b> |                                                                                                         |                         |



REFER TO FIGURE 7

REFER TO FIGURE 7

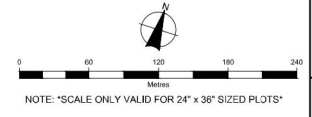


LEGEND

- STAKED NHS LIMITS (2015)
- NHS BUFFER LIMITS
- CoB GENERATED BUFFER LIMITS (2013)
- 2031 BOUNDARY
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1001369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- 263.99 EXISTING ELEVATION
- 263.99 PROPOSED ELEVATION
- PROPOSED OVERLAND FLOW ROUTE



|        |                                         |                                                                                                       |               |                  |
|--------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|---------------|------------------|
|        |                                         | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED CONDITION GRADING PLAN (1 OF 3) |               |                  |
| Client | HEWITT'S CREEK LANDOWNERS<br>GROUP INC. | Drawn<br>AD                                                                                           | Checked<br>BH | Date<br>16/09/07 |
| Scale  | H 13,000"                               | Project No.                                                                                           | 300032860     | Figure No.       |
|        |                                         |                                                                                                       |               | <b>FIG 6</b>     |



REFER TO FIGURE 8

REFER TO FIGURE 6

REFER TO FIGURE 6

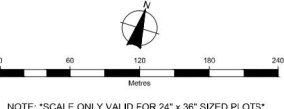
LEGEND

- STAKED NHS LIMITS (2015)
- NHS BUFFER LIMITS
- CoB GENERATED BUFFER LIMITS (2013)
- 2031 BOUNDARY

- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1691389 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOOD LINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

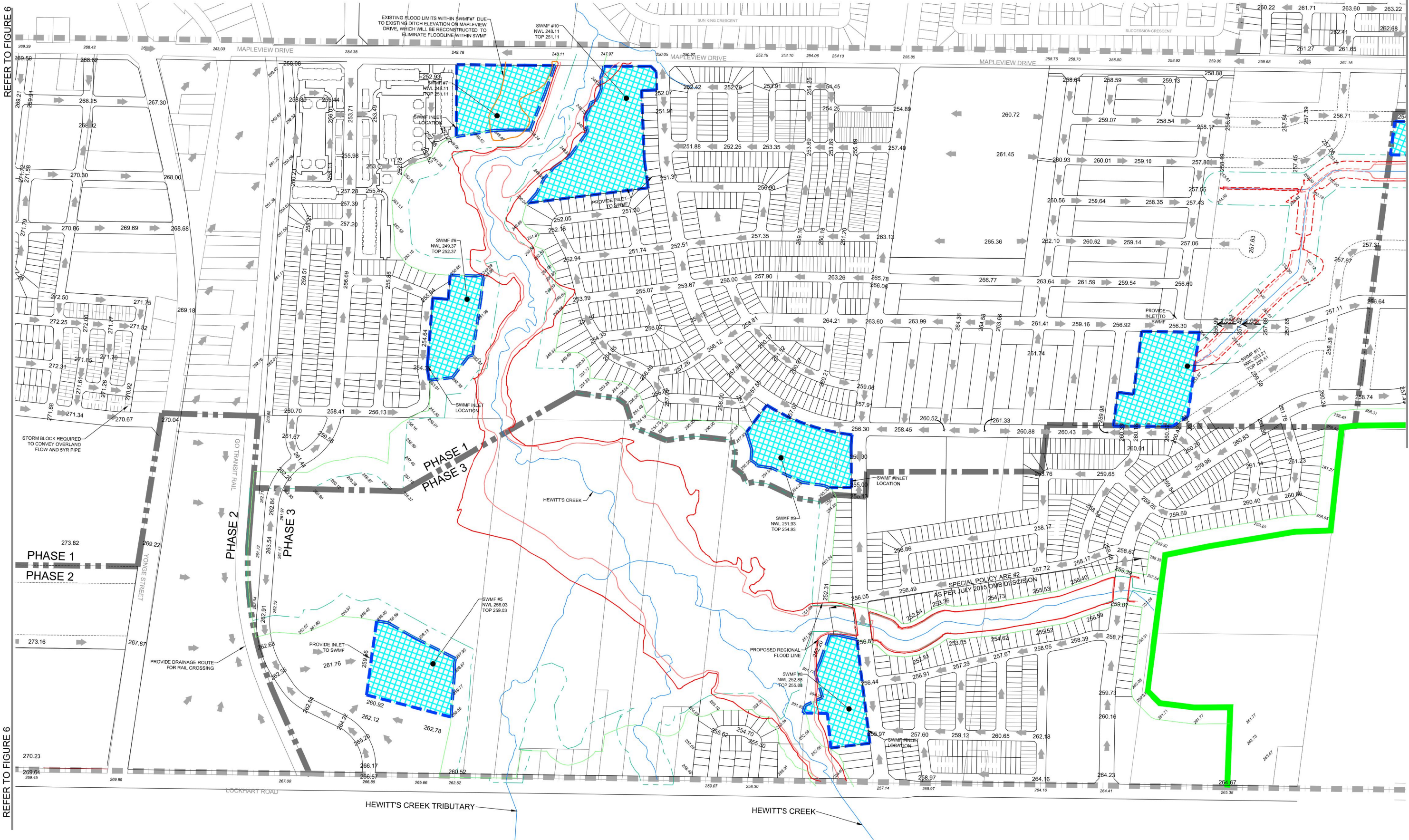
- 263.99 EXISTING ELEVATION
- 263.99 PROPOSED ELEVATION
- PROPOSED OVERLAND FLOW ROUTE



HEWITT'S CREEK LANDOWNERS  
GROUP INC.

HEWITT'S SECONDARY PLAN AREA  
SUBWATERSHED IMPACT STUDY  
PROPOSED CONDITION GRADING PLAN (2 OF 3)

|                                      |           |         |             |            |
|--------------------------------------|-----------|---------|-------------|------------|
| Client                               | Drawn     | Checked | Date        | Figure No. |
| HEWITT'S CREEK LANDOWNERS GROUP INC. | AO        | CC      | 16/09/07    | FIG 7      |
|                                      | Scale     |         | Project No. |            |
|                                      | H 1:3,000 |         | 300032860   |            |



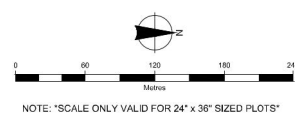




LEGEND

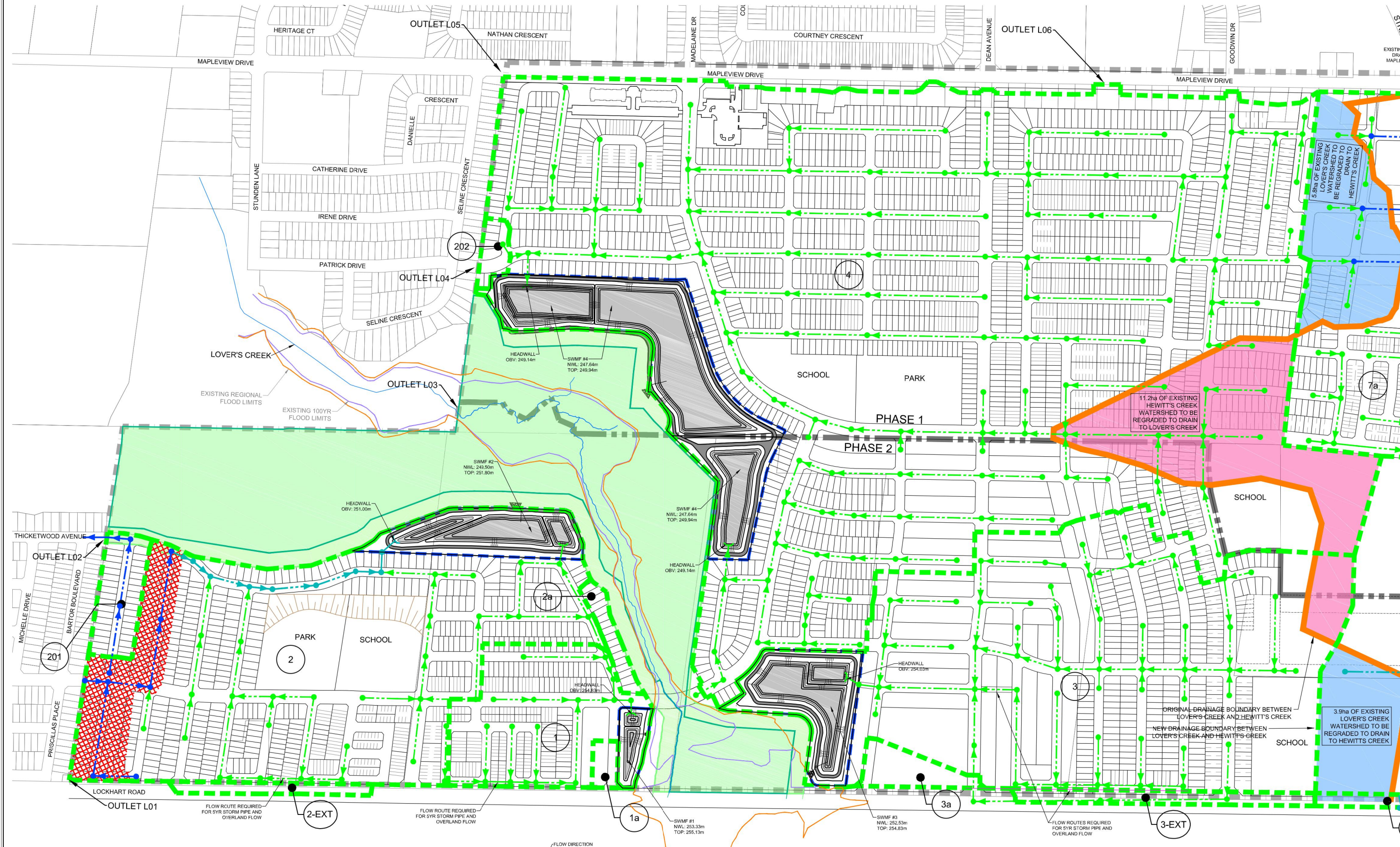
- STAKED NHS LIMITS (2015)
- NHS BUFFER LIMITS
- CoB GENERATED BUFFER LIMITS (2013)
- 2031 BOUNDARY
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- 263.99 EXISTING ELEVATION
- 263.99 PROPOSED ELEVATION
- PROPOSED OVERLAND FLOW ROUTE

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1691389 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOOD LINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.



|       |           |                                                                                                       |                                         |
|-------|-----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------|
|       |           | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED CONDITION GRADING PLAN (3 OF 3) |                                         |
|       |           | Client                                                                                                | HEWITT'S CREEK LANDOWNERS<br>GROUP INC. |
| Drawn | AD        | Checked                                                                                               | CC                                      |
| Date  | 16/09/07  | Project No.                                                                                           | 300032860                               |
| Scale | H 1:3,000 | Figure No.                                                                                            | <b>FIG 8</b>                            |





REFER TO FIGURE 10

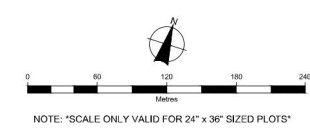
REFER TO FIGURE 10

# LEGEND

- NHS LIMITS
- NHS BUFFER LIMITS
- 100 YEAR CAPTURE AREA
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY
- ORIGINAL WATERSHED BOUNDARY

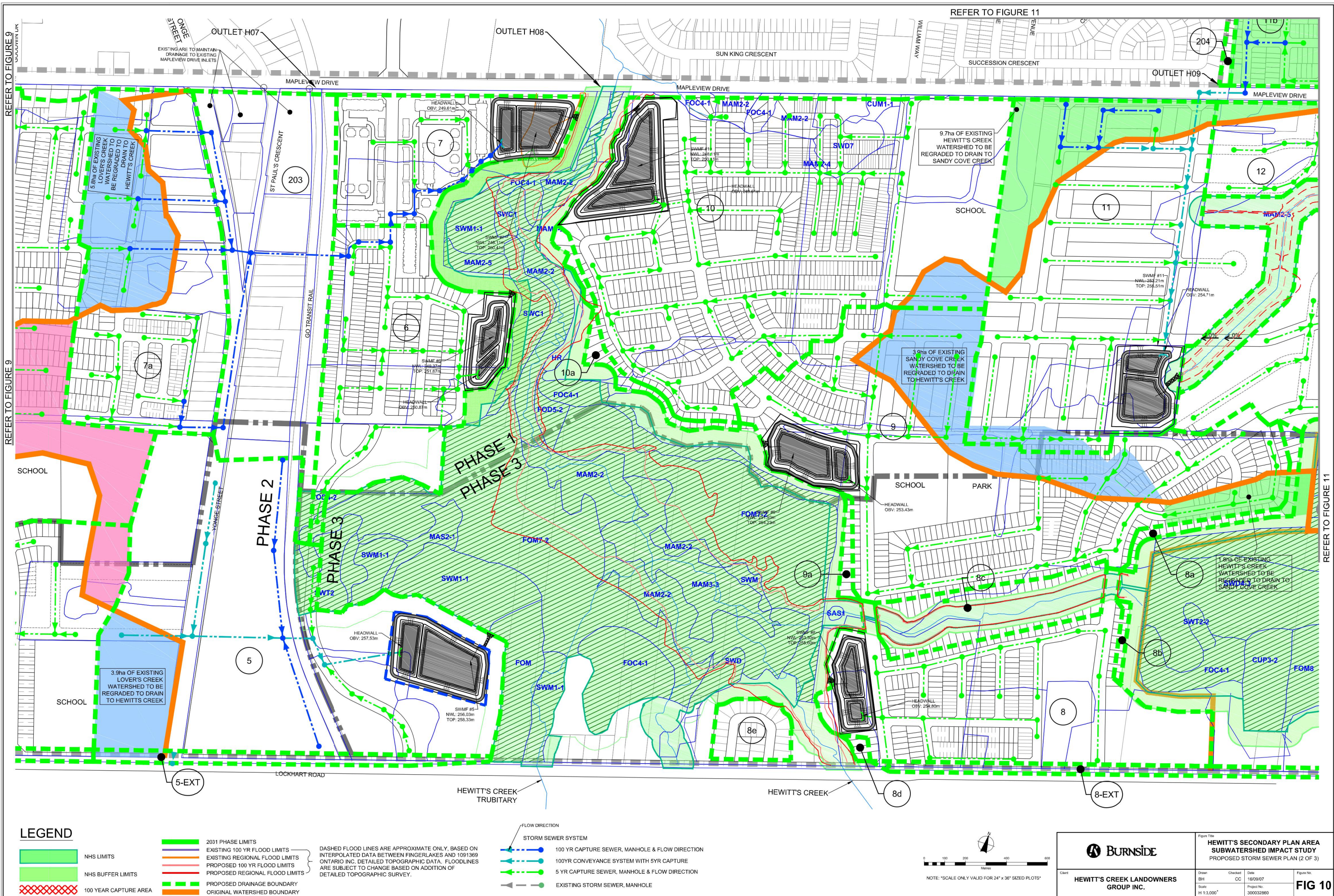
DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- FLOW DIRECTION
- STORM SEWER SYSTEM
- 100 YR CAPTURE SEWER, MANHOLE
- 100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
- 5 YR CAPTURE SEWER, MANHOLE
- EXISTING STORM SEWER, MANHOLE



|                 |                                         |                                                                                                 |              |
|-----------------|-----------------------------------------|-------------------------------------------------------------------------------------------------|--------------|
| <b>BURNSIDE</b> |                                         | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED STORM SEWER PLAN (1 OF 3) |              |
| Client          | HEWITT'S CREEK LANDOWNERS<br>GROUP INC. | Drawn                                                                                           | CC           |
| Scale           | H 1:3,000                               | Checked                                                                                         | CC           |
|                 |                                         | Date                                                                                            | 16/09/07     |
|                 |                                         | Project No.                                                                                     | 300032860    |
|                 |                                         | Figure No.                                                                                      | <b>FIG 9</b> |





REFER TO FIGURE 9

REFER TO FIGURE 9

REFER TO FIGURE 11

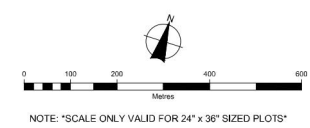
REFER TO FIGURE 11

### LEGEND

- NHS LIMITS
- NHS BUFFER LIMITS
- 100 YEAR CAPTURE AREA
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY
- ORIGINAL WATERSHED BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- FLOW DIRECTION
- STORM SEWER SYSTEM
- 100 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
- 100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
- 5 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
- EXISTING STORM SEWER, MANHOLE

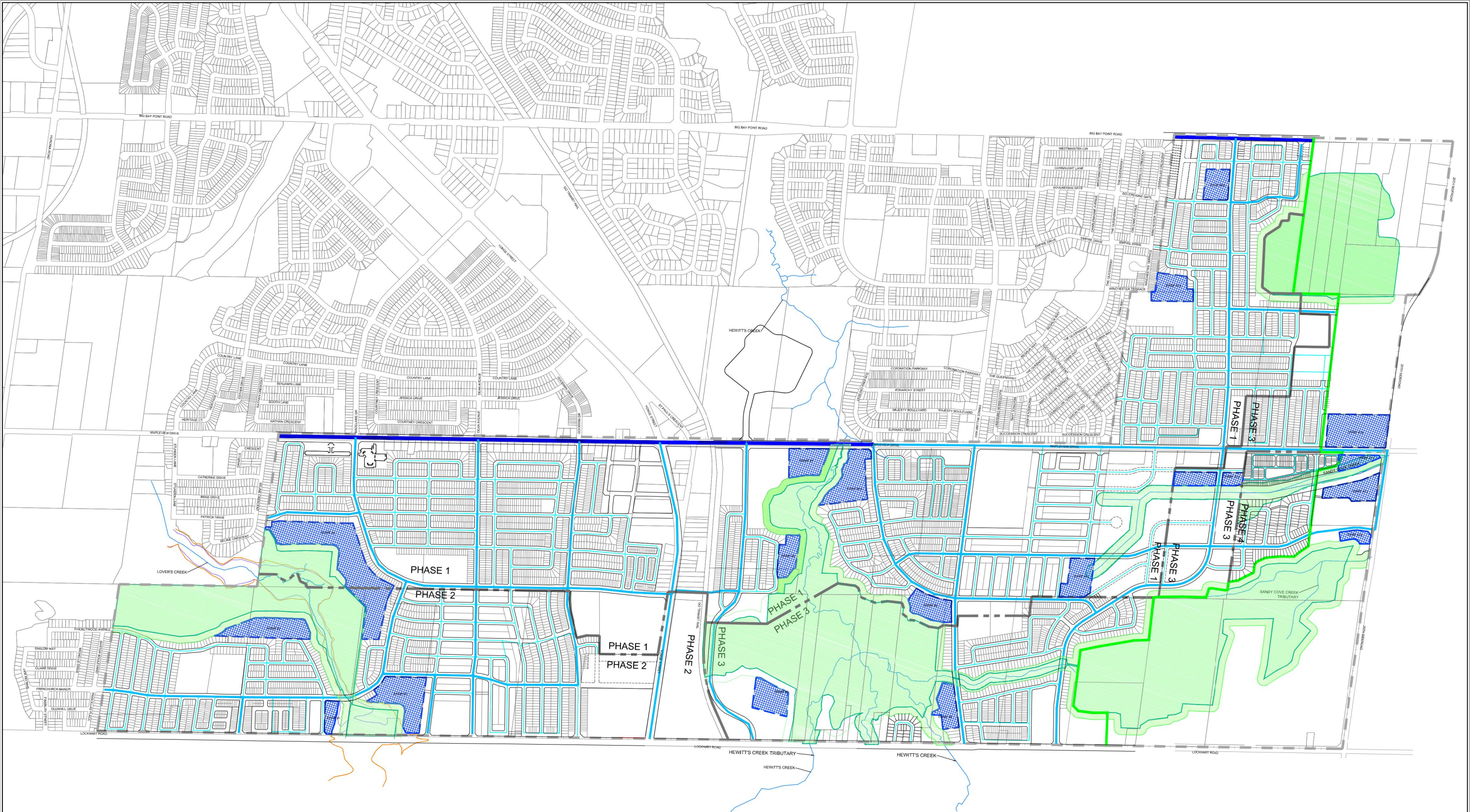


|                                                                                                          |                                                                                                 |                          |               |        |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------|---------------|--------|
| <br><b>BURNSIDE</b> | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED STORM SEWER PLAN (2 OF 3) |                          |               | FIG 10 |
|                                                                                                          | Client<br><b>HEWITT'S CREEK LANDOWNERS<br/>GROUP INC.</b>                                       | Drawn<br>BH              | Checked<br>CC |        |
| Date<br>16/09/07                                                                                         |                                                                                                 | Project No.<br>300032860 |               |        |



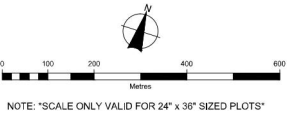






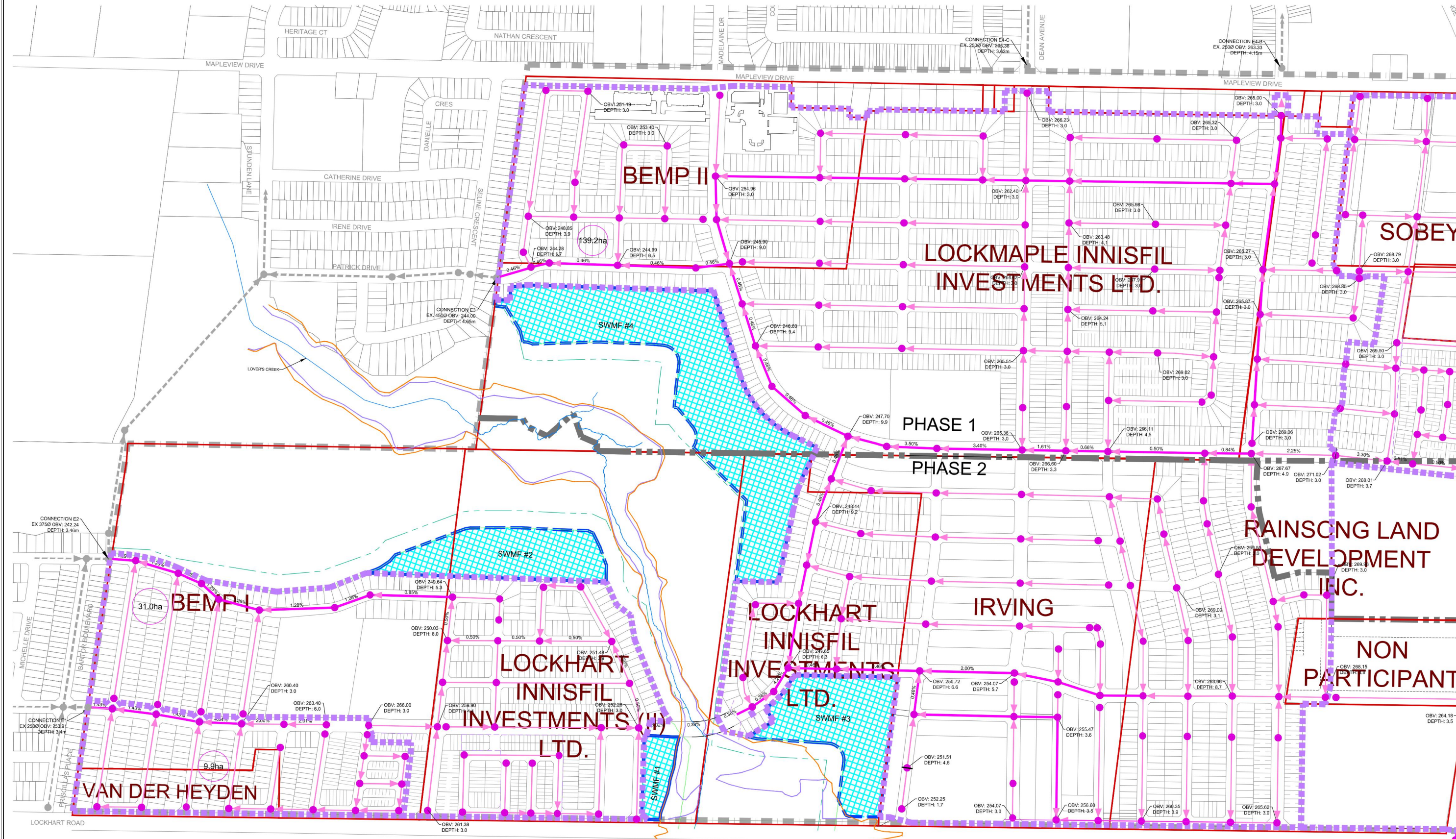
LEGEND

- |  |                            |  |                                        |
|--|----------------------------|--|----------------------------------------|
|  | DC TRUNK WATERMAIN         |  | 2031 PHASE LINE                        |
|  | LOCAL TRUNK WATERMAIN      |  | PHASING LIMITS                         |
|  | LOCAL WATERMAIN            |  | LIMIT OF HEWITT'S CREEK SECONDARY PLAN |
|  | SURVEYED NHS LIMITS (2015) |  | STAKED 2015 NHS LIMITS                 |
|  | NHS BUFFER LIMITS          |  | NHS BUFFER LIMITS                      |



|  |                                                                                                                         |                      |                           |                             |
|--|-------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------|-----------------------------|
|  | Figure Title:<br><b>HEWITT'S SECONDARY PLAN AREA<br/>SUBWATERSHED IMPACT STUDY<br/>PROPOSED WATER DISTRIBUTION PLAN</b> |                      |                           | Figure No.<br><b>FIG 12</b> |
|  | Client:<br><b>HEWITT'S CREEK LANDOWNERS GROUP<br/>INC.</b>                                                              | Drawn:<br>AO         | Checked:<br>BH            |                             |
|  |                                                                                                                         | Scale:<br>H 1:4,000' | Project No.:<br>300032860 |                             |



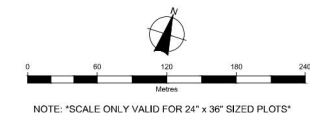


REFER TO FIGURE 14

LEGEND

- SURVEYED NHS LIMIT (2015)
- NHS BUFFER LIMIT
- 2031 PHASE LIMITS
- DEV. LIMITS
- PHASING LIMITS
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

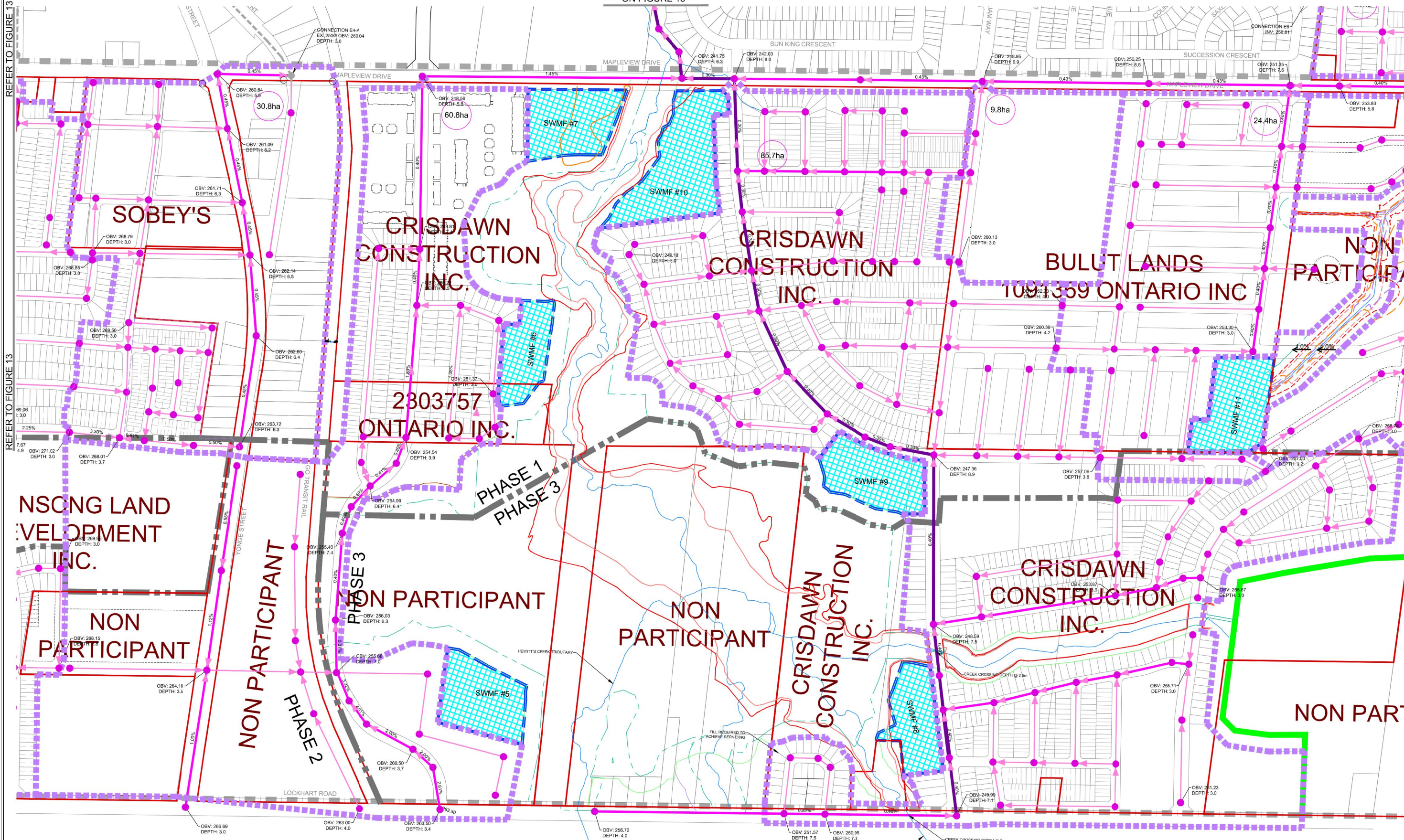


|        |                                         |                                                                                                    |               |
|--------|-----------------------------------------|----------------------------------------------------------------------------------------------------|---------------|
|        |                                         | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED SANITARY SEWER PLAN (1 OF 3) |               |
| Client | HEWITT'S CREEK LANDOWNERS<br>GROUP INC. |                                                                                                    | Figure No.    |
| Drawn  | Checked                                 | Date                                                                                               | Project No.   |
| BH     | CC                                      | 16/09/07                                                                                           | 300032860     |
| Scale  | H 1:3,000                               |                                                                                                    | <b>FIG 13</b> |



REFER TO DETAIL A  
ON FIGURE 15

REFER TO FIGURE 15



REFER TO FIGURE 13

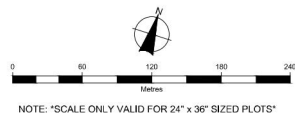
REFER TO FIGURE 15

LEGEND

- SURVEYED NHS LIMIT (2015)
- NHS BUFFER LIMIT
- 2031 PHASE LIMITS
- DEV. LIMITS
- PHASING LIMITS
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY

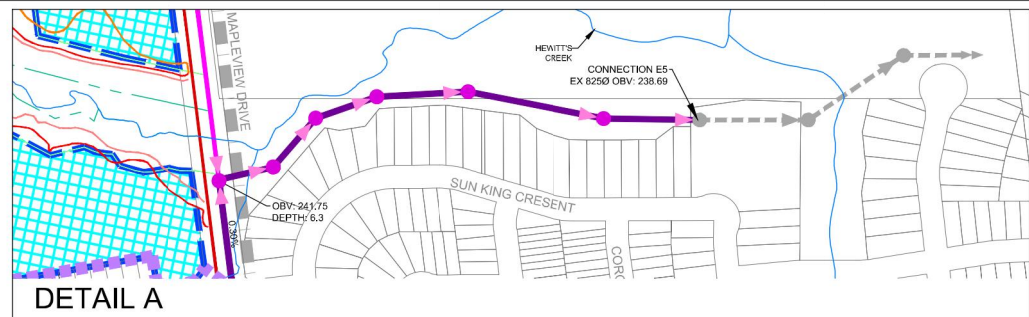
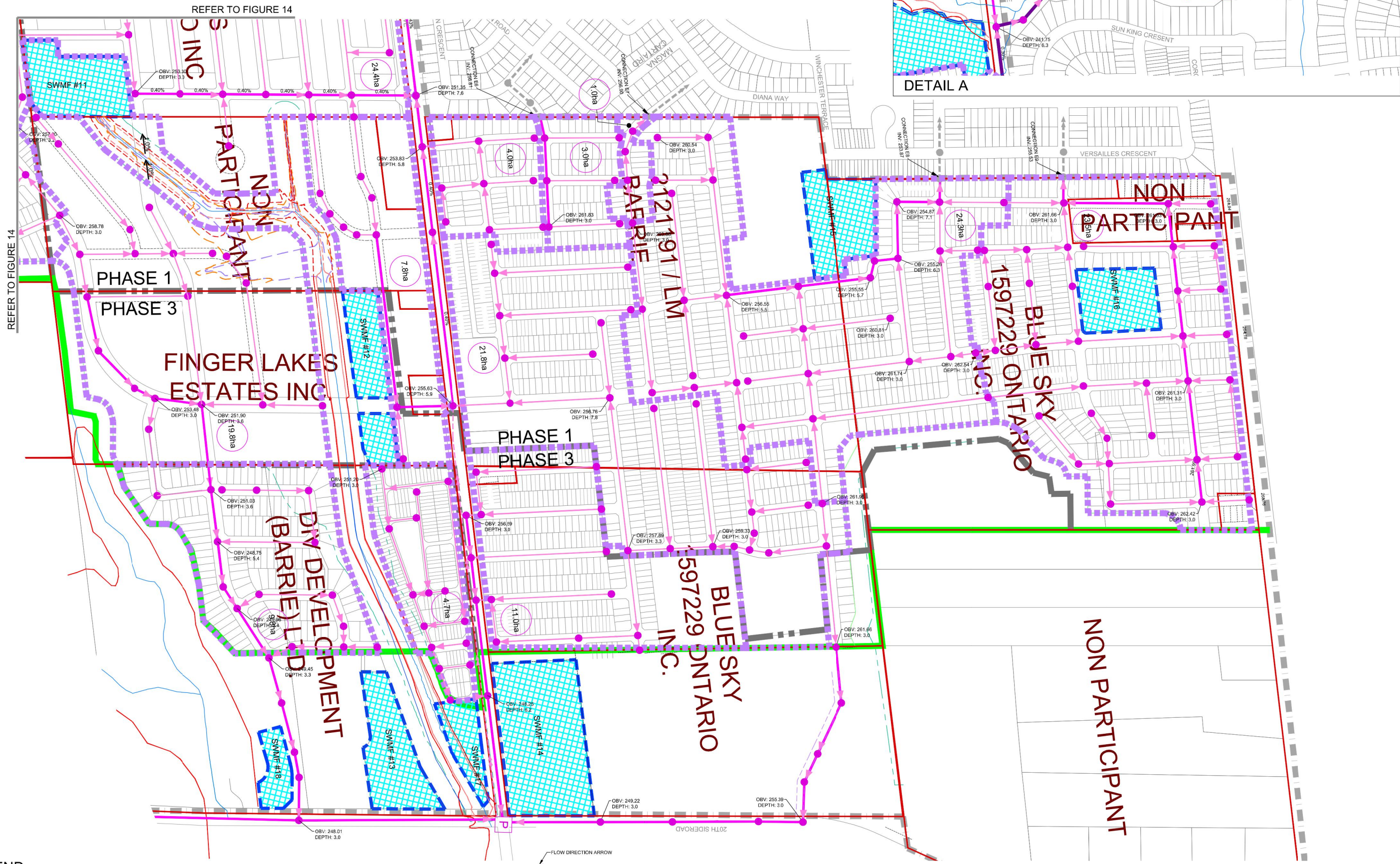
DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- FLOW DIRECTION ARROW
- SANITARY DC TRUNK SEWER
- SANITARY LOCAL TRUNK SEWER
- SANITARY LOCAL COLLECTOR SEWER
- SANITARY FORCEMAIN
- SANITARY MAN-OLE
- EXISTING SANITARY SEWER
- PUMP STATION
- FLOW DIRECTION ARROW DEPICTS SEWER CONTINUES ON IN ARROW DIRECTION



|  |                                                                                                    |       |          |                          |
|--|----------------------------------------------------------------------------------------------------|-------|----------|--------------------------|
|  | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>PROPOSED SANITARY SEWER PLAN (2 OF 3) |       |          |                          |
|  | Client                                                                                             | Drawn | Checked  | Date                     |
|  | HEWITT'S CREEK LANDOWNERS<br>GROUP INC.                                                            |       |          |                          |
|  | BH                                                                                                 | CC    | 16/09/07 | Figure No.               |
|  | Scale<br>H 1:3,000                                                                                 |       |          | Project No.<br>300032860 |
|  |                                                                                                    |       |          | <b>FIG 14</b>            |





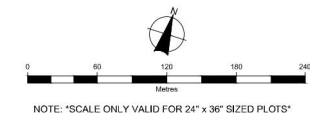
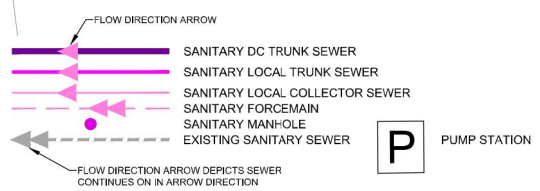
REFER TO FIGURE 14

REFER TO FIGURE 14

LEGEND

- SURVEYED NHS LIMIT (2015)
- NHS BUFFER LIMIT
- 2031 PHASE LIMITS
- DEV. LIMITS
- PHASING LIMITS
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.



|                                                           |                    |                                                                                                                             |                             |
|-----------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                           |                    | Figure Title<br><b>HEWITT'S SECONDARY PLAN AREA<br/>SUBWATERSHED IMPACT STUDY<br/>PROPOSED SANITARY SEWER PLAN (3 OF 3)</b> |                             |
| Client<br><b>HEWITT'S CREEK LANDOWNERS<br/>GROUP INC.</b> | Drawn<br>BH        | Checked<br>CC                                                                                                               | Date<br>16/09/07            |
|                                                           | Scale<br>H 1:3,000 | Project No.<br>300032860                                                                                                    | Figure No.<br><b>FIG 15</b> |



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Catchment 2A (0.69ha) consists entirely of proposed residential lots which cannot be graded to direct runoff into SWMF #2. These lots will need to be compensated for within the SWMF. The runoff will be directed overland through the NHS buffer which will provide some measure of quality control and TP removal, and may allow for some structural LID to be implemented.

A 0.75 ha portion of Lockhart Road (Catchment 2-EXT) adjacent to the Van Der Heyden lands could be routed through the proposed development into SWMF#2, however it is not proposed to provide additional TP treatment (beyond the removal rate of the SWMF itself) for the Lockhart Road ROW, nor is the intent to provide additional infiltration efforts to meet LSRCA targets for this portion of the external ROW. The uncontrolled flows to SWMF #2 include the flows from Catchment 2-EXT.

A portion of the south west part of the catchment requires a 100 year storm capture pipe to convey runoff to the SWMF. Please refer to Figure 10 for the approximate 100 year capture area and storm sewer routing.

The current SWMF block and design could allow for an expansion in the drainage area boundary or a slight reduction in the size of the SWMF/block. In addition the implementation of LID within the catchment, especially in the neighborhood park block may allow for an additional increase in the drainage area or an additional decrease in the SWM block size. Please refer to Section 5.5 for a discussion on the potential modifications related to LID implementation.

This facility is proposed to have two wet forebays (west and east) and generally meets the majority of the design criteria. Due to the orientation of the NHS boundary and the grading requirements it is difficult to orient this facility in a north-south direction, however the design does provide the required overall forebay and pond length to width ratios and proposed permanent pool and active storage depths consistent with MOECC recommendations. The design also provides sufficient area for a maintenance access road, and a dissipater outlet located outside of the floodplain to spread the discharge flow. Consideration could be given at detailed design to re-configure this SWMF to a constructed wetland facility, which could provide more opportunity for quality control and a higher TP removal efficiency.

### **Catchment 3, 3A & 3-Ext/SWMF #3**

SWMF#3 is proposed to be located on the north side of Lockhart Road and east side of Lover's Creek in the Phase 2 Lockhart Innisfil Investments lands, but also servicing a portion of the Irving Lands and Rainsong Lands. The location of this facility was recommended as part of the DSWMMP to help maintain the base flow to the upper reaches of Lover's Creek. The majority of Catchment 3 consists almost entirely of proposed residential with a portion of mixed use and institutional. There is also a small

portion of land west of the Yonge Street mixed-use corridor that originally was part of the Hewitt's Creek watershed that is now to be directed to the Lover's Creek system.

A portion of the Lockhart Road ROW extending west from Yonge Street can be directed into SWMF#3. As with the portion of Lockhart Road adjacent to Catchment 2, this portion of the ROW will need to provide stand-alone TP loading reduction efforts and water balance (infiltration) to satisfy the LSRCA.

The current SWMF block and design is sufficient for the proposed drainage area boundary, however the implementation of LID within the catchment may allow for an increase in the drainage area or a decrease in the SWM block size. Please refer to Section 5.5 for a discussion on the potential modifications related to LID implementation.

This facility generally meets the majority of the design criteria including being largely oriented in a north-south direction to mitigate temperature issues, provides overall and forebay length to width ratios and proposed permanent pool and active storage depths consistent with MOECC recommendations, provides sufficient area for a maintenance access road, and a dissipater outlet located outside of the floodplain to spread the discharge flow. Consideration could be given at detailed design to re-configure this SWMF to a constructed wetland facility, which could provide more opportunity for quality control and a higher TP removal efficiency.

#### **Catchment 4/SWMF #4**

SWMF#4 is proposed to be located on the north-east side of Lover's Creek primarily in the Phase 1 Lockmaple Innisfil Investments lands, and partially in the Phase 2 Lockhart Innisfil lands. This facility is also intended to provide quality and quantity control for the Phase 1 BEMP (II) lands, portions of the Phase 1 Rainsong and portions of the Phase 2 Irving lands.

This facility was shown as two separate ponds in the DSWMMP, however the grading, irregular boundary of the NHS and ownership boundaries lent itself to the creation of single large facility with two wet forebays set at differing elevations.

Catchment 4 consists largely of proposed residential development, with mixed use zones, a large neighbourhood park, two institutional blocks and a portion of the proposed Recreational Centre lands adjacent to Yonge Street.

A portion of the catchment draining to this SWMF drains to the Hewitt's Creek watershed in the existing condition (similar to Catchment 3). A similarly sized drainage area that in the existing condition drains to Lover's Creek is to be routed to Hewitt's Creek, with the net difference in drainage area to be less than 2%.

The current SWMF block and design could allow for an expansion in the drainage area boundary or a reduction in the size of the SWMF/block. The implementation of LID



within the catchment, especially in the neighbourhood park block may allow for an additional increase in the drainage area or an additional decrease in the SWM block size. Please refer to Section 5.5 for a discussion on the potential modifications related to LID implementation.

This facility is proposed to have two wet forebays (west and south-east) set at different elevations to better accommodate the grading constraints and generally meets the majority of the design criteria. Due to the orientation of the NHS boundary and the grading requirements it is difficult to orient this facility solely in a north-south direction.

The design does provide the required overall forebay and pond length to width ratios and proposed permanent pool and active storage depths consistent with MOECC recommendations. The design also provides sufficient area for a maintenance access road, and a dissipater outlet located outside of the floodplain to spread the discharge flow.

Consideration could be given at detailed design to re-configure this SWMF to a constructed wetland facility, or hybrid wet pond/wetland, which could provide more opportunity for quality control and a higher TP removal efficiency.

The SWMF straddles the Phase 1 and Phase 2 construction boundaries as well as ownership parcels. The conceptual design provided allows for the construction of a stand-alone facility within Phase 1, however the facility would be significantly oversized until the Phase 2 lands came online. The southeast forebay could be constructed as part of the Phase 2 works.

## **Catchment 201 & 202**

### **201 – Discharge to Existing Pratt Development – Thicketwood Drive**

In the pre-development condition approximately 3.87 ha of undeveloped drainage area was identified as contributing drainage to the Pratt Development storm sewer system and SWMF. The flow from the SPA was directed into the existing development via rear yard catchbasins and was directed north to the storm sewer network on Thicketwood Drive. Please refer to Table 9 for the pre development peak flows. The connecting pipe is shown on the as-constructed drawings as a 300 mm dia. pipe at 1.2% which has a design capacity of 0.11 cms, additional rear yard catchbasins are located at the rear of (existing lots) 39/40, at Fenchurch Manor, Lots 29/30, 26/27 and 22/23. Each location has provided a 300 mm dia. pipe with slopes ranging from 0.82% to 7.2% (a capacity of between 0.09 cms to 0.26 cms).

In the post-development condition the contributing area has been reduced to 1.82 ha, however, due to the increase in imperviousness the modelled peak flow, is anticipated to increase in the 2 and 5 year storm events, and the peak flow exceeds the capacity of the Thicketwood connection.

### **Catchment 5 & 5-EXT/SWMF #5**

SWMF#5 is proposed to be located on the west side of Yonge Street in Phase 3 lands owned by a non-participating group member. Conceptual development plans have not been made available to Burnside for review and as such all design for this facility has been completed based on Land Use Schedule 9C from the July 2015 OMB decision. A portion of the catchment (northwest corner of Lockhart and Yonge Street) is owned by Rainsong and is proposed as a school block.

Catchment 5 consists of medium/high density residential, the southern half of the Yonge Street mixed use corridor, the institutional (school) block at the northwest corner of Yonge Street and Lockhart Road, and the remainder of the recreational centre block that will not be treated by SWMF #4. We have assumed that the existing culvert crossing on Yonge Street at Carpe Diem Orchards and the existing culvert crossing under the GO Transit Rail line (where the NHS limits touch the edge of the GO Transit railway corridor) will be abandoned or altered in favour of directing flow to SWMF #5. In addition we have assumed that 100 year conveyance will be required south along Yonge Street, east along Lockhart and north through the proposed development lands to SWMF#5.

The current SWMF block and design meets the assumed needs of the development area, however without additional conceptual details including the internal grading of the site, road network, and lotting concept it is not possible to comment further on the appropriate size and configuration of the SWMF. The block and design provided in this report demonstrate that a drainage area of this size and land use designation could be accommodated.

Additional details will need to be developed and presented by the land owner for this facility.

### **Catchment 6/SWMF #6**

SWMF#6 is proposed to be located on the west side of Hewitt's Creek primarily in the Phase 1 Crisdawn Construction lands, and partially in the 2303757 Ontario Inc. lands. This facility is intended to provide quality and quantity control primarily for the southern part of the Crisdawn Construction Inc. lands on the west side of Hewitt's Creek, the 2303757 Ontario Inc. lands and a portion of the non-participating member development lands south of 2303757 Ontario Inc.

Catchment 6 consists of roughly equal proportion of residential development and mixed use areas, with one small park. The 4 ha of land that drained east under the railway tracks (part of existing Catchment 115) via the 900 mm dia. culvert is to be redirected north along the west side of the train tracks and the 900 mm dia. culvert abandoned.



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### Catchment 3, 3A & 3-EXT

| Catchment ID                                                                                           | 3             | 3A                     | 3-EXT         |
|--------------------------------------------------------------------------------------------------------|---------------|------------------------|---------------|
| Catchment Area                                                                                         | 40.98         | 1.18                   | 1.28          |
| Impervious %                                                                                           | 59%           | 54%                    | 50%           |
| Dominant Soil Type                                                                                     | Silty Clay    | Silty Clay             | Silty Clay    |
| Effective Soil Type                                                                                    | Silty Clay    | Silty Clay             | Silty Clay    |
| Hydraulic Conductivity                                                                                 | 1 mm/hr       | 1 mm/hr                | 1 mm/hr       |
| LSRCA Hydraulic Conductivity <sup>A</sup>                                                              | 0.4 mm/hr     | 0.4 mm/hr              | 0.4 mm/hr     |
| 25 mm Runoff Volume (m <sup>3</sup> )                                                                  | 6046          | 160                    | 160           |
| <b>Required Infiltration Storage Volume<sup>B</sup></b>                                                |               |                        |               |
| 25 mm Runoff                                                                                           | 318500        | 9000                   | N/C           |
| 12.5 mm Runoff                                                                                         | 200000        | 5500                   | N/C           |
| 5 mm Runoff                                                                                            | 65000         | 2000                   | N/C           |
| <b>Recommended Infiltration Target</b>                                                                 |               |                        |               |
|                                                                                                        | Best Effort   | Best Effort            | N/C           |
| <b>Recommended Filtration Target</b>                                                                   |               |                        |               |
|                                                                                                        | 25 mm         | 25 mm                  | N/C           |
| <b>LID Opportunities</b>                                                                               |               |                        |               |
| Park Block                                                                                             | None          | None                   | None          |
| School/Community Centre                                                                                | 26500         | None                   | None          |
| Accessible NHS Buffer (Linear m)                                                                       | None          | None                   | None          |
| ROW (Linear m)                                                                                         | 4839          | 111                    | 551           |
| Pervious Area available for Additional Topsoil (m <sup>2</sup> )                                       | 168018        | 5428                   | None          |
| SWM Control                                                                                            | SWMF 3        | Compensation in SWMF 3 | SWMF 3        |
| Discharge Point                                                                                        | Lover's Creek | Lover's Creek          | Lover's Creek |
| Notes                                                                                                  |               |                        |               |
| <sup>A</sup> LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)     |               |                        |               |
| <sup>B</sup> Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 |               |                        |               |

The majority of the soils in Catchment 3 & 3a are predominantly a silty clay with an infiltration rate of 1.0 mm/hr or 0.4 mm/hr with the factor of safety. It is therefore not feasible to implement subsurface infiltration LID in this catchment.

There is a large school block which could be utilized for LID but no large park block, no proposed open spaces, and no accessible NHS buffer areas (limited to around SWMF block within floodplain). A total of 1,008 m of the 5663 m proposed ROW (18%) has no constraints (high groundwater, SGRA/ESGRA).

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As such, the following are the LID recommendations for Catchment 3/3a:

- Infiltration LIDs are to be provided where possible to achieve groundwater balance volumes as outlined in Section 4.6.3 to the extent possible. Additional topsoil depths of 300 mm, as outlined in Section 5.5.2.1, on all of the proposed lots could provide some measure of infiltration, however no credit is currently available for this method.
- 25 mm target to be primarily achieved through LID filtration and end-of-pipe attenuation measures.

#### Catchment 4

| Catchment ID                                                     | 4             |
|------------------------------------------------------------------|---------------|
| Catchment Area                                                   | 120           |
| Impervious %                                                     | 55%           |
| Dominant Soil Type                                               | Silty Clay    |
| Effective Soil Type                                              | Silty Clay    |
| Hydraulic Conductivity                                           | 1.0 mm/hr     |
| LSRCA Hydraulic Conductivity <sup>A</sup>                        | 0.4 mm/hr     |
| 25 mm Runoff Volume (m <sup>3</sup> )                            | 16602         |
| <b>Required Infiltration Storage Volume<sup>B</sup></b>          |               |
| 25 mm Runoff (m <sup>3</sup> )                                   | 900000        |
| 12.5 mm Runoff (m <sup>3</sup> )                                 | 550000        |
| 5 mm Runoff (m <sup>3</sup> )                                    | 200000        |
| <b>Recommended Infiltration Target</b>                           |               |
|                                                                  | Best Effort   |
| <b>Recommended Filtration Target</b>                             |               |
|                                                                  | 25 mm         |
| <b>LID Opportunities</b>                                         |               |
| Park Block (m <sup>2</sup> )                                     | 28100         |
| School/Community Centre (m <sup>2</sup> )                        | 24300         |
| Accessible NHS Buffer (Linear m)                                 | 238           |
| ROW (Linear m)                                                   | 16741         |
| Pervious Area available for Additional Topsoil (m <sup>2</sup> ) | 540000        |
| SWM Control                                                      | LID/SWMF 4    |
| Discharge Point                                                  | Lover's Creek |

#### Notes

<sup>A</sup>LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)

<sup>B</sup>Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 void ratio



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The soils in Catchment 4 are predominantly a silty clay with an infiltration rate of 1.0 mm/hr, or 0.4 mm/hr with the factor of safety. It is therefore not feasible to implement subsurface infiltration LID in this catchment.

There is both a large school block and park block, both of which could be used for filtration LID or infiltration if the site specific conditions are favourable. In addition there is 6478 m of unconstrained ROW and 216 m of NHS Buffer which could also be used for filtration LID or infiltration LID if site specific geotechnical information support it.

As such, the following are the LID recommendations for Catchment 4:

- Infiltration LIDs are to be provided to achieve groundwater balance volumes as outlined in Section 4.6.3 to the extent possible. Additional topsoil depths of 300 mm, as outlined in Section 5.5.2.1, on all of the proposed lots could provide some measure of infiltration, however no credit is currently available for this method.
- 25 mm target to be primarily achieved through LID filtration and end-of-pipe attenuation measures

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### 5.5.5 Hewitt's Creek LID Recommendations

#### Catchment 5/5-EXT

| Catchment ID                                                                                                      | 5              | 5-EXT          |
|-------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| Catchment Area                                                                                                    | 32.74          | 1.65           |
| Impervious %                                                                                                      | 76%            | 50%            |
| Dominant Soil Type                                                                                                | Loam           | Loam           |
| Effective Soil Type                                                                                               | Loam           | Loam           |
| Hydraulic Conductivity                                                                                            | 13.2 mm/hr     | 13.2 mm/hr     |
| LSRCA Hydraulic Conductivity <sup>A</sup>                                                                         | 5.28 mm/hr     | 5.28 mm/hr     |
| 25 mm Runoff Volume (m <sup>3</sup> )                                                                             | 6068           | 206            |
| <b>Required Infiltration Storage Volume<sup>B</sup></b>                                                           |                |                |
| 25 mm Runoff (m <sup>3</sup> )                                                                                    | 26000          | N/C            |
| 12.5 mm Runoff (m <sup>3</sup> )                                                                                  | 16000          | N/C            |
| 5 mm Runoff (m <sup>3</sup> )                                                                                     | 5500           | N/C            |
| <b>Recommended Infiltration Target</b>                                                                            |                |                |
|                                                                                                                   | 5 mm           | N/C            |
| <b>Recommended Filtration Target</b>                                                                              |                |                |
|                                                                                                                   | 20 mm          | N/C            |
| <b>LID Opportunities</b>                                                                                          |                |                |
| Park Block (m <sup>2</sup> )                                                                                      | None           | None           |
| School/Community Centre (m <sup>2</sup> )                                                                         | 32600          | None           |
| Accessible NHS Buffer (Linear m)                                                                                  | 541            | None           |
| ROW (Linear m)                                                                                                    | 679            | 85             |
| Pervious Area available for Additional Topsoil (m <sup>2</sup> )                                                  | 78576          | 8250           |
| SWM Control                                                                                                       | LID/SWMF 5     | LID/ SWMF 5    |
| Discharge Point                                                                                                   | Hewitt's Creek | Hewitt's Creek |
| Notes                                                                                                             |                |                |
| <sup>A</sup> LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)                |                |                |
| <sup>B</sup> Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 void ratio |                |                |

The majority of Catchment 5 includes non-participating land owners and as such this report does not provide full recommendations for this area. The soils in Catchment 5 are a loam with a low infiltration rate and although infiltration LIDs within this catchment are possible, it is not likely that the 25 mm target can be achieved. We have provided a breakdown for the required infiltration targets and options for Catchment 5 in Appendix G based on the information available.



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The large school block within Rainsong owned lands at the NW corner of Lockhart Road and Yonge Street provides an opportunity to implement infiltration/filtration LID.

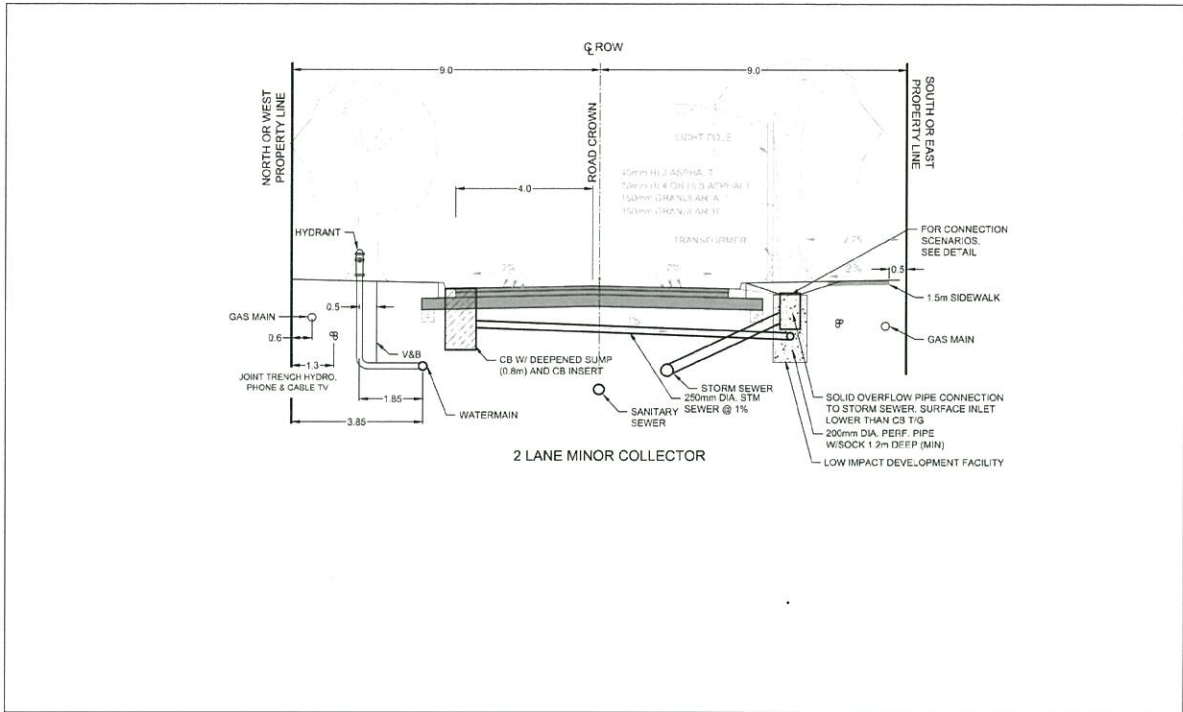
## Catchment 6

A summary of LID considerations and recommendations for the catchment are outlined below.

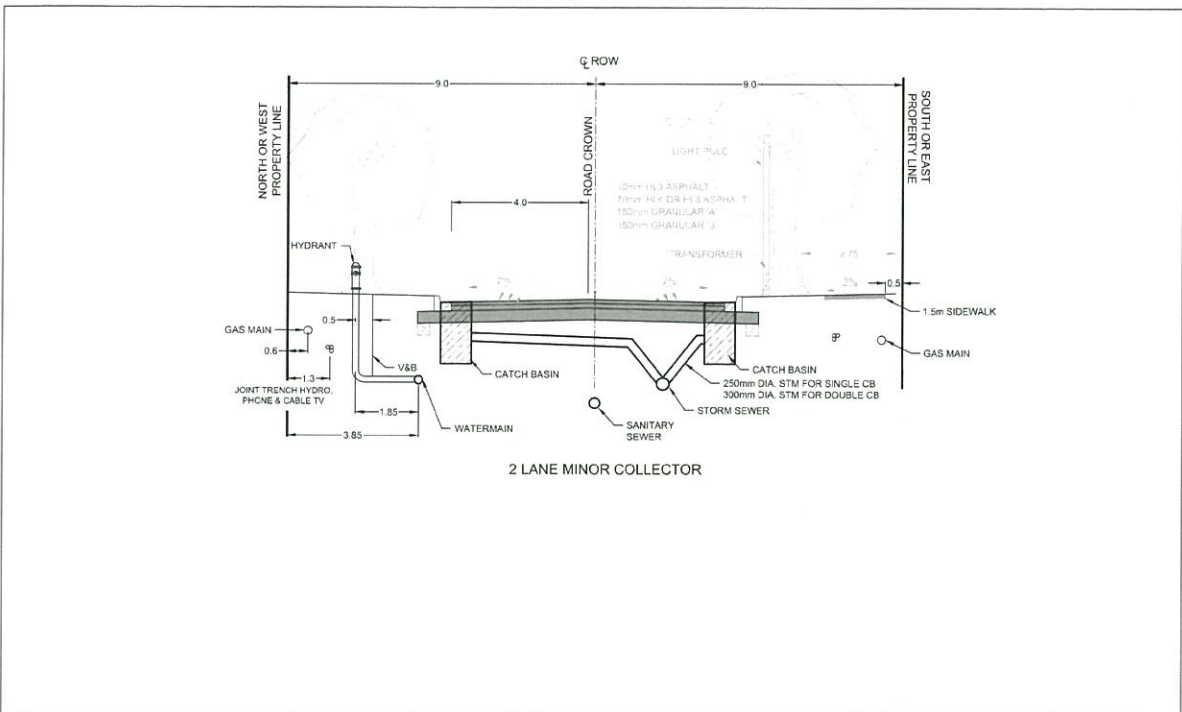
**Table 16 LID Considerations – Catchment 6**

| Catchment ID                                                                                                      | 6              |
|-------------------------------------------------------------------------------------------------------------------|----------------|
| Catchment Area                                                                                                    | 14.56          |
| Impervious %                                                                                                      | 53%            |
| Dominant Soil Type                                                                                                | Loam           |
| Effective Soil Type                                                                                               | Loam           |
| Hydraulic Conductivity                                                                                            | 13.2 mm/hr     |
| LSRCA Hydraulic Conductivity <sup>A</sup>                                                                         | 5.28 mm/hr     |
| 25 mm Runoff Volume (m <sup>3</sup> )                                                                             | 16602          |
|                                                                                                                   |                |
| <b>Required Infiltration Storage Volume<sup>B</sup></b>                                                           |                |
| 25 mm Runoff (m <sup>3</sup> )                                                                                    | 8000           |
| 12.5 mm Runoff (m <sup>3</sup> )                                                                                  | 5000           |
| 5 mm Runoff (m <sup>3</sup> )                                                                                     | 2000           |
| <b>Recommended Infiltration Target</b>                                                                            |                |
|                                                                                                                   | Best Effort    |
| <b>Recommended Filtration Target</b>                                                                              |                |
|                                                                                                                   | 25 mm          |
| <b>LID Opportunities</b>                                                                                          |                |
| Park Block (m <sup>2</sup> )                                                                                      | 3400           |
| School/Community Centre (m <sup>2</sup> )                                                                         | None           |
| Accessible NHS Buffer (Linear m)                                                                                  | 661            |
| ROW (Linear m)                                                                                                    | 2036           |
| Pervious Area available for Additional Topsoil (m <sup>2</sup> )                                                  | 68432          |
| SWM Control                                                                                                       | LID/SWMF 6     |
| Discharge Point                                                                                                   | Hewitt's Creek |
|                                                                                                                   |                |
| Notes                                                                                                             |                |
| <sup>A</sup> LSRCA Factor of Safety Required = 2.5 (Divide measured Hydraulic Conductivity by 2.5)                |                |
| <sup>B</sup> Assumes 24 hr drawdown, 1.0 m tall stone trench with bottom set at 1.2 m below grade, 0.4 void ratio |                |

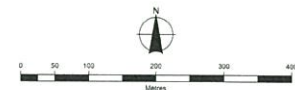
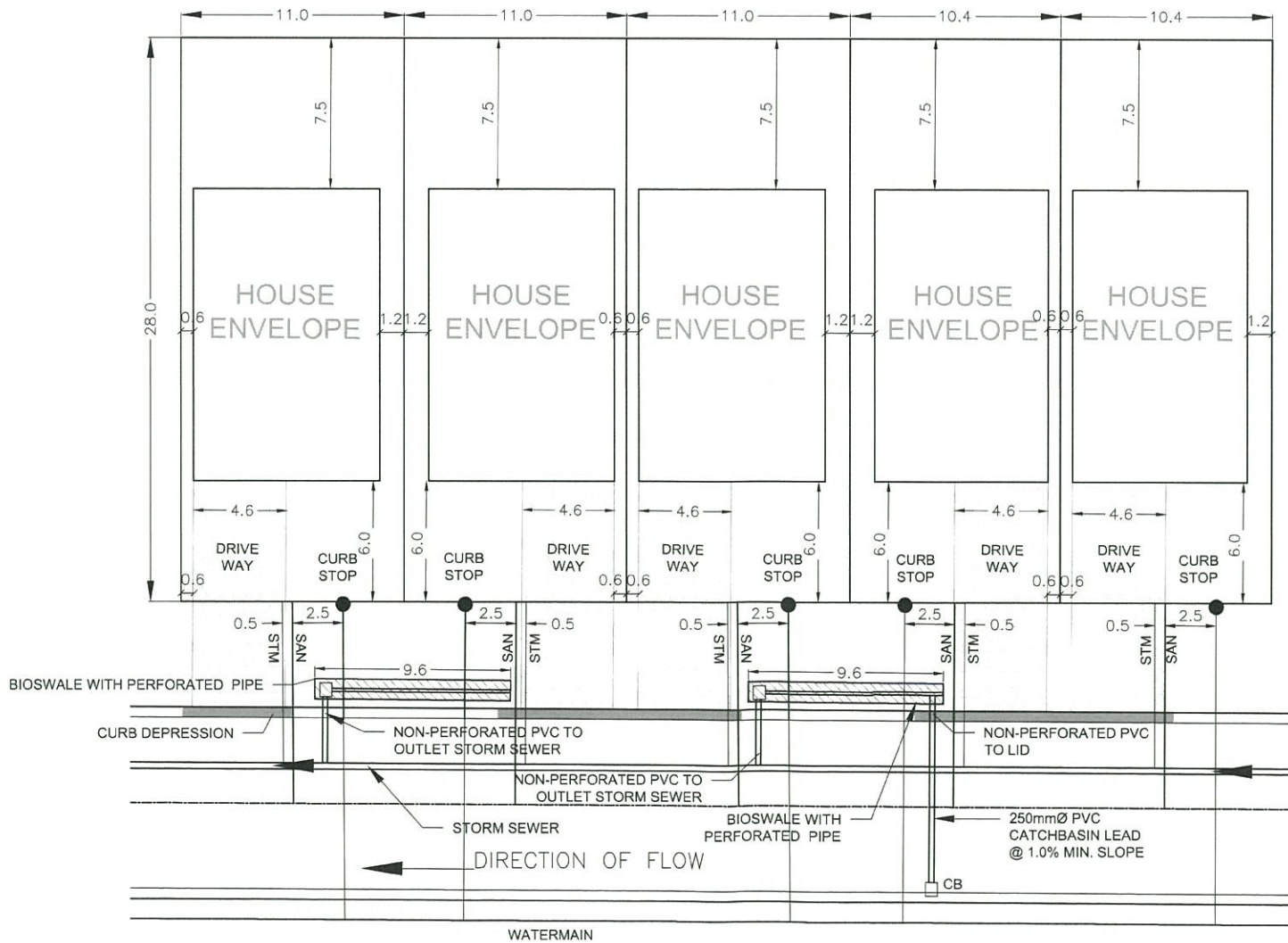
TYPICAL 18m ROW LID CONNECTIONS



TYPICAL 18m ROW STANDARD CATCHBASIN CONNECTIONS

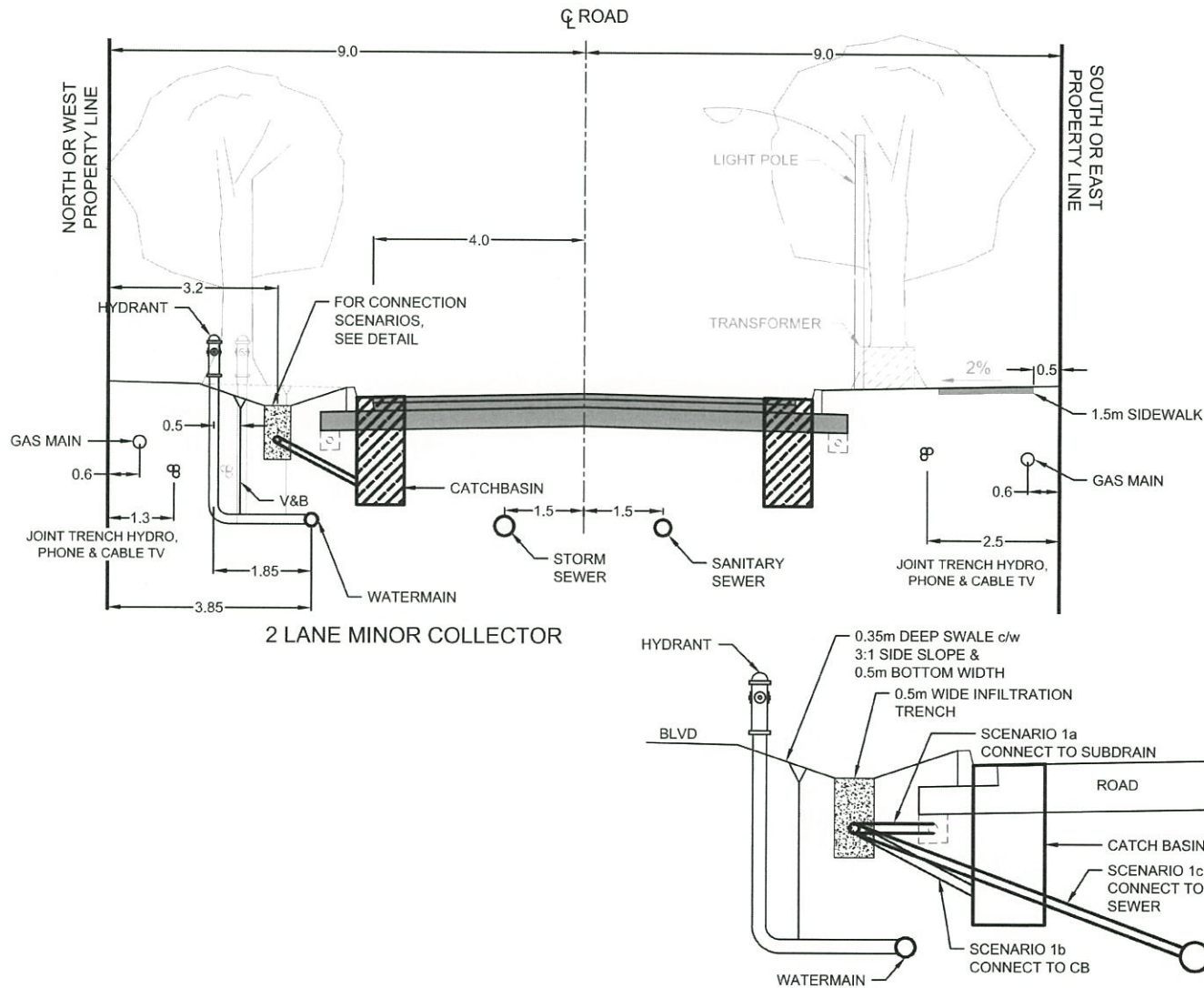


TYPICAL 10.4m AND 11m LOT LID LAYOUT



|            |                                         |                                                                                                                    |           |
|------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------|
|            |                                         | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>LOW IMPACT DEVELOPMENT SECTIONS AND<br>TYPICAL LAYOUT |           |
| Client     | HEWITT'S CREEK LANDOWNERS<br>GROUP INC. | Drawn                                                                                                              | SW        |
| Checked    | CC                                      | Date                                                                                                               | 16/09/08  |
| Scale      | NOT TO SCALE                            | Project No.                                                                                                        | 300032960 |
| Figure No. | LID01                                   |                                                                                                                    |           |





**HEWITT'S CREEK LANDOWNERS  
GROUP INC.**

Figure Title

**HEWITT'S SECONDARY PLAN AREA  
SUBWATERSHED IMPACT STUDY**  
LID CROSS SECTION OPTIONS  
18m ROW WITH 8m ASPHALT

Client

Drawn

Checked

Date

Figure No.

BH

JT

16/09/08

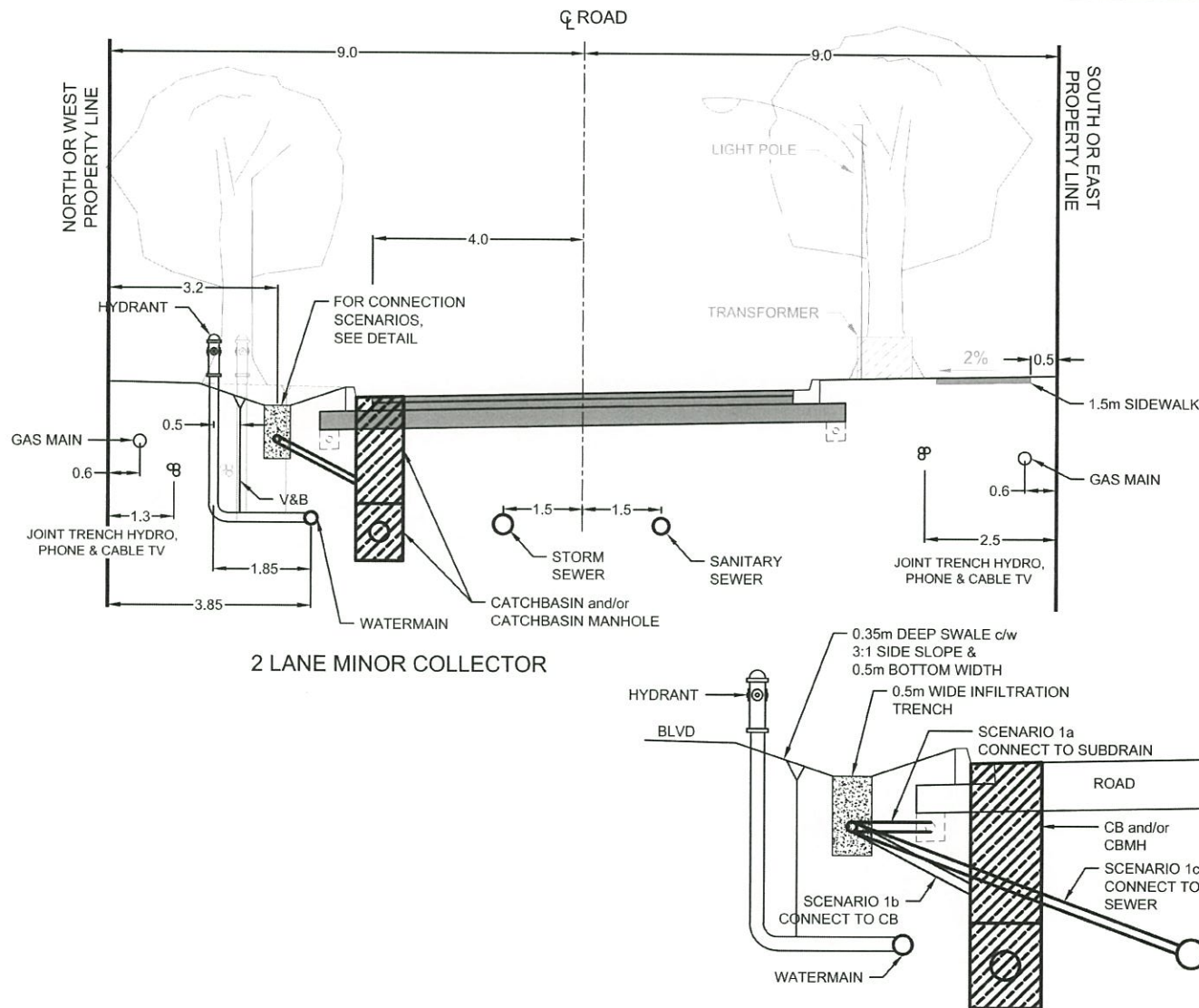
Scale

Project No.

NOT TO SCALE

300032860

**SCN01**



|                                                                                                                                         |                                      |          |                            |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------|----------------------------|
| <b>HEWITT'S SECONDARY PLAN AREA<br/>SUBWATERSHED IMPACT STUDY</b><br>LID CROSS SECTION OPTIONS<br>18m ROW WITH 8m SUPERELEVATED ASPHALT |                                      |          |                            |
| Client                                                                                                                                  | HEWITT'S CREEK LANDOWNERS GROUP INC. |          |                            |
| Drawn                                                                                                                                   | Checked                              | Date     | Figure No.<br><b>SCN02</b> |
| BH                                                                                                                                      | JT                                   | 16/09/08 |                            |
| Scale                                                                                                                                   | Project No.                          |          |                            |
| NOT TO SCALE                                                                                                                            | 300032860                            |          |                            |



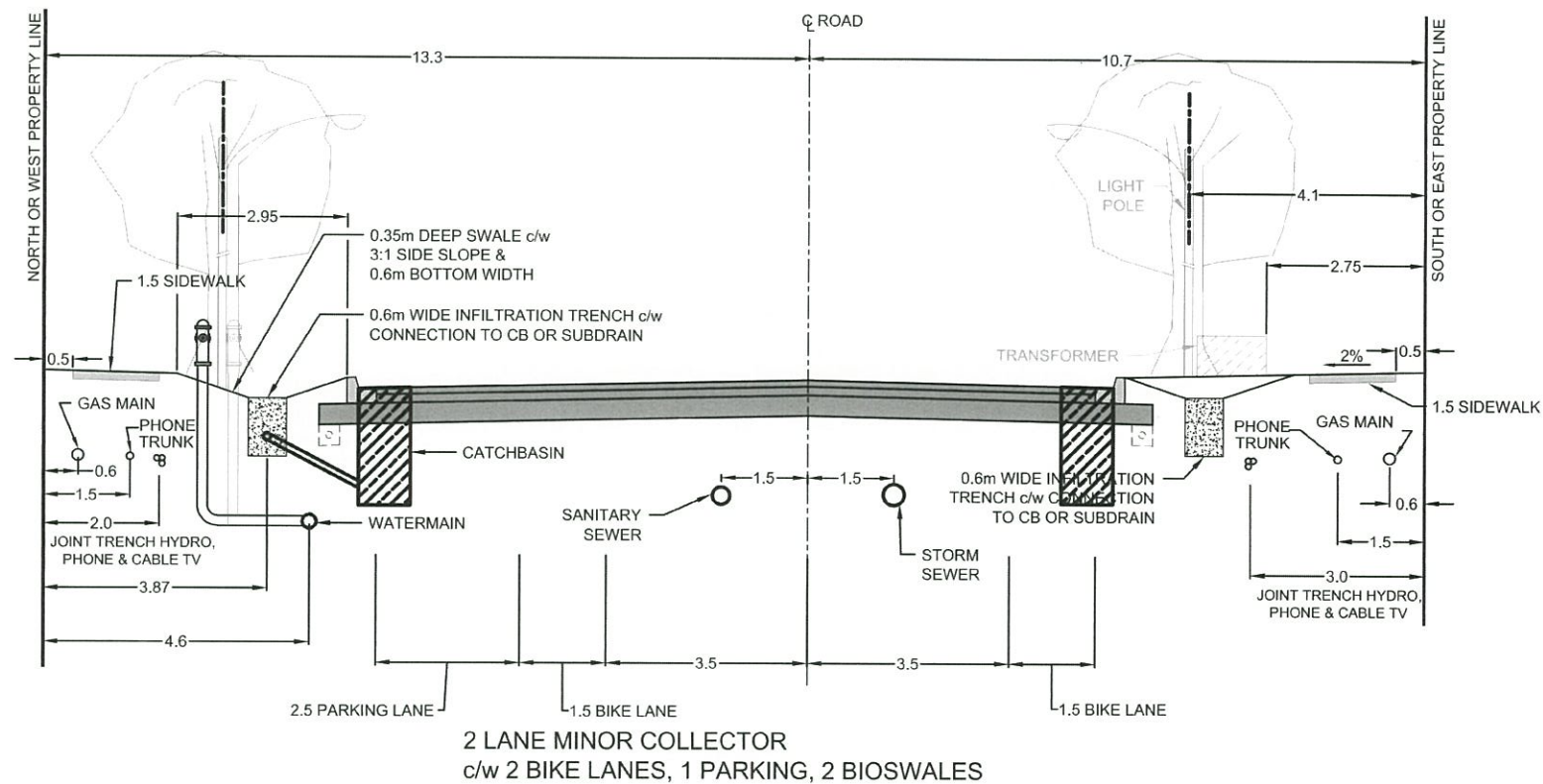


Figure Title

**HEWITT'S SECONDARY PLAN AREA  
SUBWATERSHED IMPACT STUDY**  
LID CROSS SECTION OPTIONS  
24m ROW WITH 12.5m ASPHALT

Client

**HEWITT'S CREEK LANDOWNERS  
GROUP INC.**

Drawn

BH

Checked

JT

Date

16/09/08

Scale

NOT TO SCALE

Project No.

300032860

Figure No.

**SCN03**

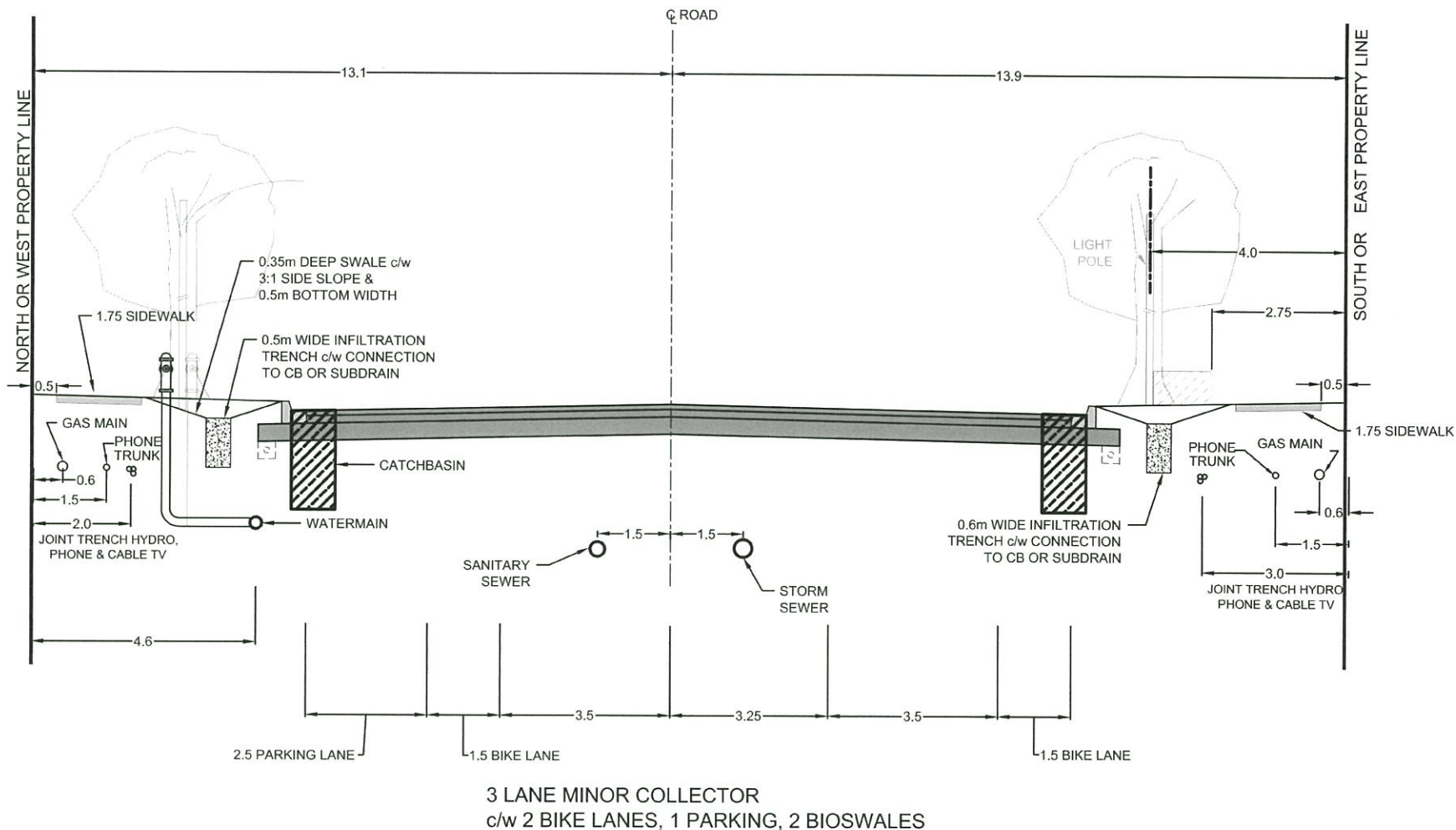


Figure Title

**HEWITT'S SECONDARY PLAN AREA  
SUBWATERSHED IMPACT STUDY**  
LID CROSS SECTION OPTIONS  
27m ROW WITH 15.75m ASPHALT

Client

**HEWITT'S CREEK LANDOWNERS  
GROUP INC.**

Drawn

BH

Checked

JT

Date

16/09/08

Scale

NOT TO SCALE

Project No.

300032860

Figure No.

**SCN04**



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### 6.3 Sanitary Servicing

There are 11 existing gravity sanitary sewer connections identified in the Sanitary Servicing Master Plan. We provide Table 8.2A of the Wastewater Collection Master Plan which details the potential connection locations below for ease of reference.

Wastewater Collection Master Plan  
City of Barrie  
October 2013 Final



| Table 8.2A Summary of Available Connection Points |                                        |                        |                           |                     |
|---------------------------------------------------|----------------------------------------|------------------------|---------------------------|---------------------|
| Connection Point                                  | Location Description                   | Manhole Identification | Downstream Pipe Size (mm) | Invert Elev. (m)    |
| <b>Hewitt's Land</b>                              |                                        |                        |                           |                     |
| E1                                                | Fenchurch Manor and Bartor Boulevard   | SAP09044               | 250                       | 251.00 <sup>1</sup> |
| E2                                                | Thicketwood Ave. and Bartor Boulevard  | SAP09067               | 300                       | 241.70              |
| E3                                                | Patrick Dr. & Seline Cres.             | SAP090006A             | 450                       | 243.97              |
| E4C                                               | Mapleview Drive East and Dean Ave.     | SAP25121               | 250                       | 265.227             |
| E4B                                               | Mapleview Drive East and Goodwin Drive | SAP25122               | 250                       | 263.18              |
| E4A                                               | Mapleview Drive East and St. Crescent  | 6940                   | 250                       | 259.793             |
| E5                                                | Royal Jubilee & Mapleview Drive        | SAH08044 <sup>2</sup>  | 825                       | 237.86              |
| E6                                                | End of current Unicorn Lane            | SAH09043               | 375                       | 256.80              |
| E7                                                | End of current Regina Road             | SAH08021               | 250                       | 257.00              |
| E8                                                | Winchester Terrace and Empire Drive    | SAH08063               | 300                       | 253.87              |
| E9                                                | Winchester Terrace and Sovereigns Gate | SAH08066               | 250                       | 255.40              |

Note 1: No invert elevation information available, an invert elevation of 251.00 was assumed in the models.

Note 2: Through the proposed manhole SAH09099 on the Annexed Area northern boundary. SAH09099 and SAH08044 were used in Annexed Area models and pre-2010 City boundary models respectively.

Please note there appears to be several discrepancies between the inverts and sizes of the sanitary shown in the above Table. We have utilized the information from the as-constructed drawing sets (where available) for the purposes of this Report, however we recommend that the developer confirm the sizes and inverts prior to completing draft plan design.

- Connection Point E1 – The as-constructed drawings indicate the sanitary sewer invert is 253.66, significantly higher than the assumed elevation of 251.00
- Connection Point E2 – The information available in the as-constructed record drawings. The record drawings indicate an invert of 241.86 and a 375 mm dia. pipe size for the stub that extends east into the Hewitt's SPA. The downstream pipe is a 375 mm dia. at an elevation of 241.70.
- Connection Point E3 – The as-constructed drawings indicate a slight difference in the invert elevation of 244.00 vs the above table showing 243.97
- Connection Point E4C – The as-constructed drawings indicate the north invert for this connection to be at an elevation of 265.13 not 265.227 as indicated in the Table
- Connection Point E4A – The SAMH at the intersection of St. Paul's Crescent and Mapleview Drive was installed with an 11 m long stub extending south towards the edge of the ROW. The invert of the 250 mm dia. stub is listed as 260.20 and the invert of the outlet pipe to the north is listed as 259.793 as indicated in the Table above.

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks  
September 2016

There are a number of sanitary works described in Section 8.2 of the Master Plan which are required to be constructed primarily in Phase 1 of SPA which will also service Phases 2, 3 and in part post-2031 as follows;

- 550 m of 825 mm Hewitt's Trunk sanitary sewer north from Maplevue Drive East along the pre-2010 City boundary
- A proposed extension of the Hewitt's Trunk sanitary sewer on Maplevue Drive East to the current City boundary
- A proposed trunk sewer to connect to the Hewitt's Trunk along Maplevue Drive East to convey Phase 1, Phase 3 and Post 2031 wastewater flows
- Construction of new sewage pumping station in Phase 3 at the intersection of 20<sup>th</sup> Sideroad and Maplevue Drive. A second phase would be implemented to accommodate post-2031 sewage flows.

The Master Plan for sanitary servicing for the Hewitt's SPA identifies the preferred servicing alternative for the Preferred (future) Land Use Concept to be a combination of a pumping station (Option E1) and deep gravity sewers (Option E3).

The updated sewer design criteria for the City identified the following key design components:

- Design capacity not to exceed 85% full flow
- A peaking factor from 1.5 to 4
- A minimum slope of 0.4% for local sewer
- A minimum cleansing velocity of 0.75 m/s when flowing full

In addition the City of Barrie Sanitary Sewage Collection System Policies and Design Guidelines 2012 are to be used including the following;

- Average Daily Residential Demand of 225 l/cap/day
- Institutional/Commercial Demand of 28 m<sup>3</sup>/ha
- Industrial Demand of 35 m<sup>3</sup>/ha (select lands only)

The sanitary tributary areas and associated flows calculated by the Master Plan have been updated and adjusted to reflect the current conceptual land use plan compiled from information available from the Hewitt's Landowner's Group. Please refer to Figure 13 for the updated sanitary catchment area plan.

The calculated peak sewage flows to the 11 connection points are reproduced from Table 8.4 from the Master Plan below along with the updated flows based on the revised conceptual plan. Please note that we have not extended the calculation beyond 2031 as that is beyond the scope of this Report.

**Table 39 Calculated Sewage Flows to Existing Connection Points**

| Connection | Manhole | 2031 | 2031 | Receiving |
|------------|---------|------|------|-----------|
|------------|---------|------|------|-----------|



Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks  
September 2016

| Point | Identification | Master Plan             | SIS                     | Pipe Capacity |
|-------|----------------|-------------------------|-------------------------|---------------|
|       |                | Discharge<br>Flow (L/s) | Discharge<br>Flow (L/s) | (L/s)         |
| E1    | SAP09044       | 5                       | 7.3                     | 59.5          |
| E2    | SAP09067       | 77                      | 20.8                    | 96.0          |
| E3    | SAP09006A      | 66                      | 79.8                    | 156.2         |
| E4A   | 6940           | 24                      | 34.5                    | 40.3          |
| E4B   | SAP25122       | 11                      | n/a                     | n/a           |
| E4C   | SAP25121       | 1                       | n/a                     | n/a           |
| E5    | SAH08044       | 129                     | 157.7                   | 1435.4        |
| E6    | SAH09043       | 2                       | 2.3                     | 229.3         |
| E7    | SAH08021       | 8                       | 1.0                     | 40.8          |
| E8    | SAH08063       | 16                      | 14.6                    | 53.0          |
| E9    | SAH08066       | 14                      | 15.5                    | 37.6          |

The proposed sanitary flows and areas based on the revised conceptual plan vary (in some cases significantly) from the proposed Master Plan flows, however the proposed flows are less than the capacity of the receiving pipe. The full downstream pipe network should be reviewed with the City to confirm capacity to the discharge point.

In the case of connection point E4A, which includes the sanitary discharge from the Sobey's lands, the downstream pipe capacity may limit development. At detailed design, the pipe discharge should not exceed 85% capacity of the receiving pipe, which may limit the number of units within this parcel. Additional detailed analysis will be required to confirm pipe sizing and the distribution of the proposed units within the development area.

## 6.4 Water Distribution

### 6.4.1 External Water Supply

The municipal water supply for the City of Barrie is currently obtained from twelve groundwater wells as well as several surface water sources, with a total combined capacity of 81.3 million liters per day (MLD), with an additional two wells at design stage. The City is divided into five major pressure zones, with the two southern zones (2S and 3S) being serviced by surface water sources, and the remaining three northern zones (1, 2N and 3N) being serviced by groundwater sources.

The Hewitt's SPA lies within pressure zone 2S, which is serviced by a surface water treatment plant (SWTP) located on the shore of Kempenfelt Bay. The ultimate capacity of the plant is 240 MLD, however it is being implemented in phases, with the initial capacity at 60 MLD.

Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks  
September 2016

The Master Plan identified that the overall existing water supply for the City of Barrie is sufficient for the projected demand, to the 2031 projected demand, however the Hewitt's SPA lies within southern pressure zone 2S, and it is anticipated that if the five pressure zones remain distinct, then the Phase 1 surface water treatment plant capacity will be exceeded by 2.0 MLD by 2029.

The identified solutions to resolve the projected shortfall in capacity is to implement water efficiency measures and through the optimization of existing unit processes in the surface water treatment plant, including upgrading one of the low-lift pumps, increasing the primary membrane operation temperature and several other minor upgrades.

The Master Plan identified additional external trunk watermain upgrades to meet Maximum Day (potable water) and fire flow demands for the Hewitt's SPA (Section 5.2, Water Storage and Distribution Master Plan). The main upgrades include the following;

- 400 mm dia. trunk main on Big Bay Point Road between 20<sup>th</sup> Sideroad and Versailles Crescent.
- 600 mm dia. trunk main connecting Maplevue Drive East to Big Bay Point Road west of Royal Jubilee Drive.
- 750 mm dia. trunk main connecting Maplevue Drive East to Big Bay Point Road at Madeline Drive.
- 600 mm dia. trunk main on Maplevue Drive East between Madeline Drive and Royal Jubilee Drive.
- 750 mm dia. trunk main connecting Lockhart Road to Maplevue Drive along Huronia Road.
- 200 mm & 300 mm dia. mains on 20<sup>th</sup> Sideroad and Lockhart Road.

#### **6.4.2 Internal Water Distribution**

The internal water distribution network as proposed within the secondary plan is shown on "Drawing 2". The internal network consists of 200 mm and 300 mm dia. watermain pipes connecting the external network on Lockhart, 20<sup>th</sup> Sideroad, Maplevue Drive East and Big Bay Point Road.

The network as proposed in the Secondary Plan has been modified to reflect the current conceptual plan developed by the Owner's Group. Please refer to Figure 12 for a revised version of the watermain network. Efforts have been made to maintain the same number of connections and approximate routing configurations that was presented in the Secondary Plan.

### **6.5 Storm Sewer Network**

The storm sewer network is to be designed for the 1 in 5 year storm event without surcharge as per the City of Barrie engineering standards. There are several notable



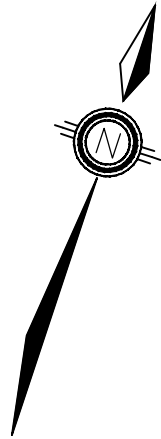
Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks  
September 2016

exceptions where proposed grading requires the implementation of 100 year capture storm sewers. The areas requiring larger storm sewer pipes are as follows;

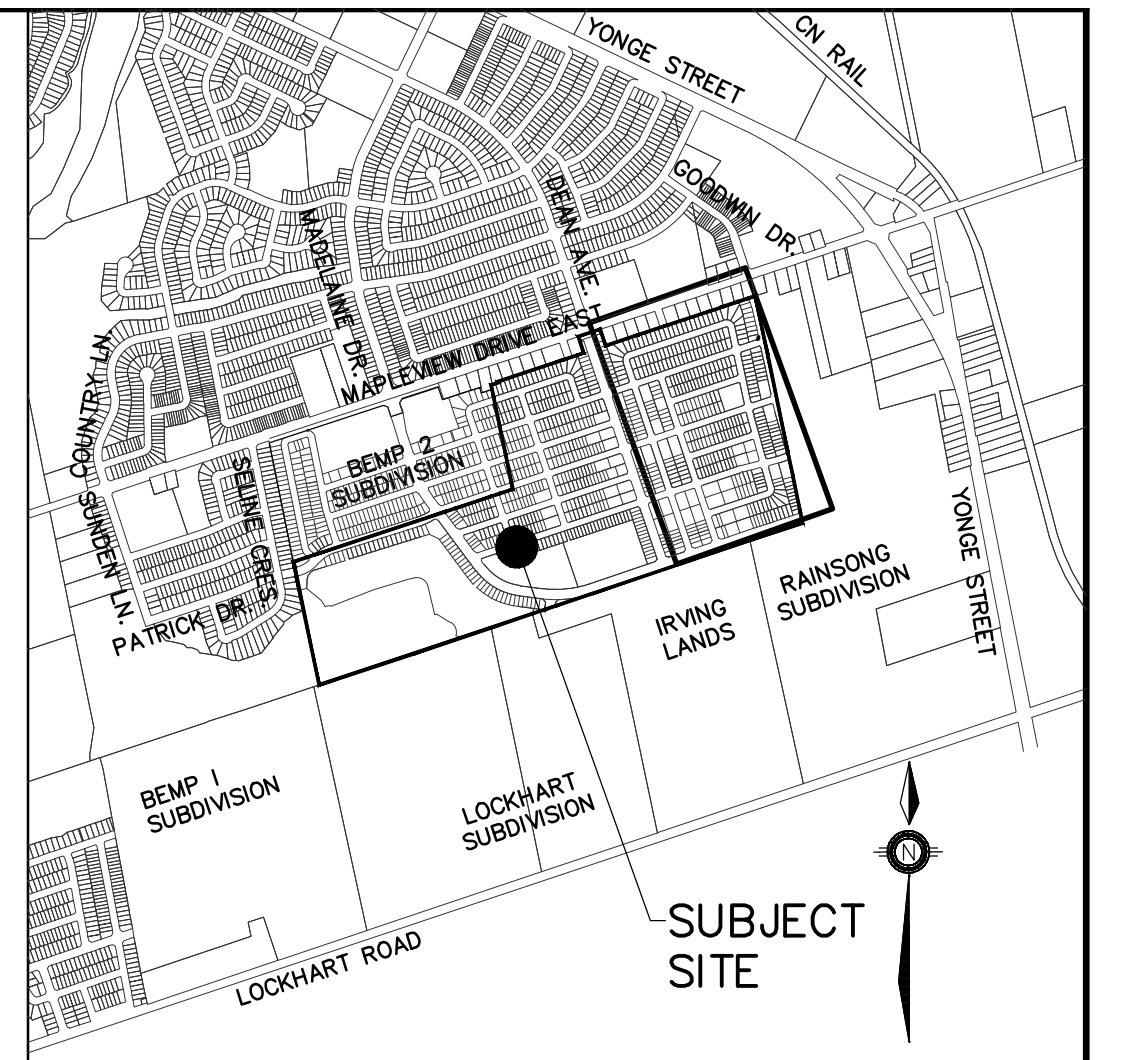
- A 100 year capture pipe is required in the south west corner of the study area to service a portion of the Van Der Heyden and BEMP 1 lands. The 100 year capture pipe will service 3.8 ha of residential area and extend north from Lockhart Road to SWMF#2.
- A 100 year capture pipe is required to convey runoff from the LM Barrie Development south under Maplevue Drive, through the Bulut Lands to SWMF#11

Please refer to Figures 9 to 11 for the storm sewer design plans as well as to Section 5.5 of this Report for additional information on routing within each catchment





REFER TO DWG. NO. SWM-1



**KEY PLAN**  
NTS

**LEGEND**

- DDLVS124 STORM MAINTENANCE HOLE
- DDLVS123 STORM DOUBLE CATCHBASIN
- DDLVS399 STORM CATCHBASIN
- PROP. STORM SEWER & DIRECTION OF FLOW
- CATCHMENT BOUNDARY
- SOIL TYPE BOUNDARY
- CATCHMENT AREA ID NUMBER
- RUN-OFF COEFFICIENT
- AREA (ha.)
- DIRECTION OF POST DEVELOPMENT 100 YEAR STORM EVENT OVERLAND FLOW
- EXISTING CONTOUR AND ELEVATION

G:\Eng\_3D\GOL-14134-Lockmaple\Production\DWG\GOL-14134-STORM DRAINAGE.dwg Layout:SWM-2 Plotted Jul 20, 2020 @ 4:27pm by kscopin The Jones Consulting Group Ltd.

|                                                                        |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |  |  |  |  |  |  |  |  |
|------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--|--|--|--|--|--|--|--|
| REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES |                   | BENCHMARK:<br>BENCHMARK NO: 0011831U462S SOUTHWEST CORNER OF ST. PAUL'S CRESCENT AND YONGE STREET. TABLET SET HORIZONTALLY IN NORTH FACE OF CONCRETE FOUNDATION OF ST. PAUL'S ANGLICAN CHURCH, AT NORTH-EAST CORNER (TOWER) 15.2m WEST OF BELL POLE AND 9.2m SOUTH-EAST OF "V" IN TWIN BIRCH TREES 15cm BELOW BRICK.<br>ELEV. 251.480<br>BENCHMARK NO: 0101980454 CONCRETE BRIDGE CARRYING MAPLEVIEW DRIVE EAST OVER LOVERS CREEK, 0.65km EAST OF HURONIA ROAD. TABLET IS SET HORIZONTALLY IN THE NORTH FACE, 5.45m NORTH OF CENTRELINE OF ROAD, 20cm WEST OF THE NORTH-EAST CORNER OF BRIDGE, 19cm BELOW TOP OF COPING.<br>ELEV. 241.862<br>BENCHMARK NO: 0101980407 LOCATED ON THE NORTH SIDE OF MAPLEVIEW DRIVE APPROXIMATELY 500m EAST OF HURONIA ROAD.<br>BENCHMARK NO: 0101980404 LOCATED ON THE SOUTH SIDE OF MAPLEVIEW DRIVE APPROXIMATELY 830m WEST OF YONGE STREET. |         |  |  |  |  |  |  |  |  |
| 2.                                                                     | SECOND SUBMISSION | JUN 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | JWI     |  |  |  |  |  |  |  |  |
| 1.                                                                     | FIRST SUBMISSION  | MAY 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | JWI     |  |  |  |  |  |  |  |  |
| NO.                                                                    | REVISIONS         | DATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | INITIAL |  |  |  |  |  |  |  |  |

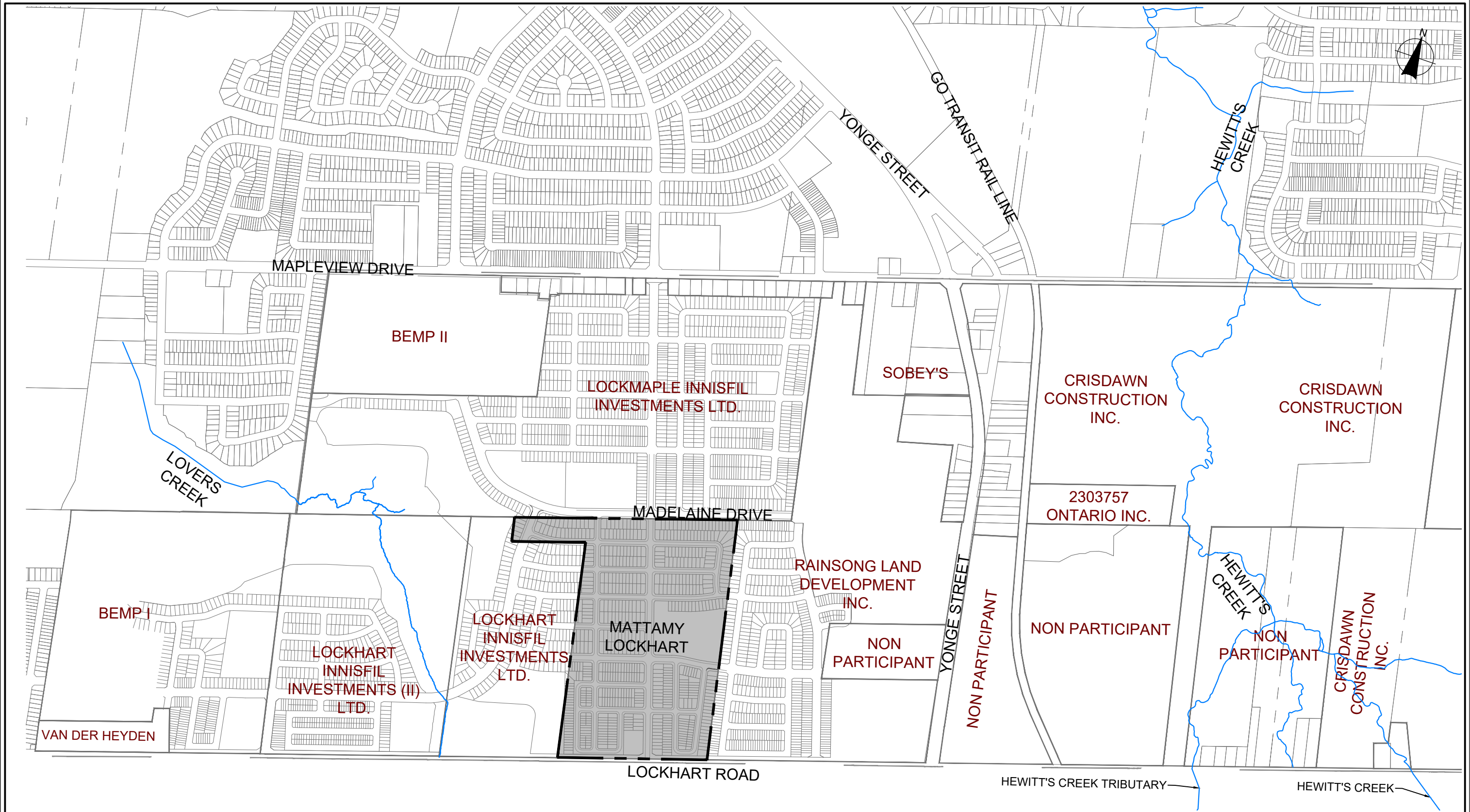
LOCKMAPLE INNISFIL INVESTMENTS LIMITED  
LOCKMAPLE SUBDIVISION  
STORMWATER MANAGEMENT PLAN  
PEAK FLOW MODEL  
CATCHMENT AREAS

J. W. INGRAM  
100143779  
20-07-17  
PROVINCE OF ONTARIO

JONES CONSULTING GROUP LTD.  
PLANNERS & ENGINEERS  
229 Mapleview Dr. E. Unit 1  
Barrie, ON L4N 0W5  
P. 705.734.2538  
F. 705.734.1056

|         |     |               |         |          |
|---------|-----|---------------|---------|----------|
| DESIGN  | JWI | SCALE: 1:2000 | DATE    | JAN 2019 |
| DRAWN   | JB  | PROJECT       | DWG. NO |          |
| CHECKED | JWI | GOL-14134     | SWM-2   |          |



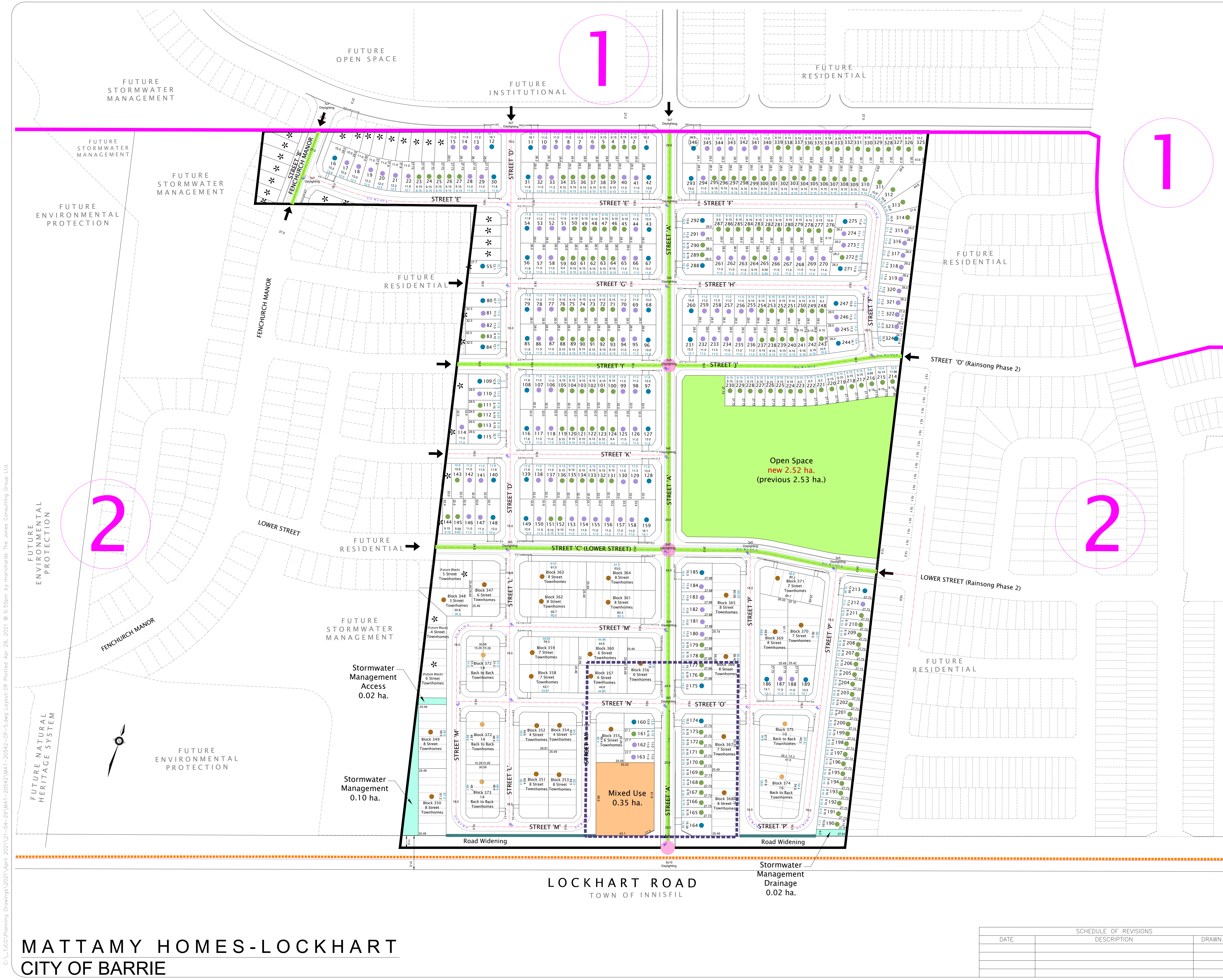


LIMIT OF SUBJECT SITE

|                                                                                                       |                             |                          |                            |
|-------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------|----------------------------|
|  <b>BURNSIDE</b> | Figure Title                |                          |                            |
|                                                                                                       | <b>MATTAMY LOCKHART FSR</b> |                          |                            |
| <b>MATTAMY LOCKHART</b>                                                                               | SITE LOCATION PLAN          |                          |                            |
|                                                                                                       | Client                      | Drawn<br>LP              | Checked<br>PH              |
|                                                                                                       |                             | Scale<br>1:10000         | Date<br>21/06/23           |
|                                                                                                       |                             | Project No.<br>300052092 | Figure No.<br><b>FIG 1</b> |



C:\TUG\Planning Drawings\2021\April 2021\21-04-29\MAT-20542\WAT-20542-CP-5.dwg Layout:CP Plotted Apr 29, 2021 @ 5:55pm by merichords The Jones Consulting Group Ltd.



KEY PLAN

SCALE 1:25,000

### Conformity Review Plan

620 Lockhart Road, Barrie  
Mattamy Homes Canada  
2021

- Subject Lands (Boundary is subject to confirmation by an Ontario Land Surveyor, areas are approximate)
  - Total Site Area 27.94 ha.
  - Net Developable 27.94 ha.
- City of Barrie Phasing Line
- City of Barrie Settlement Area Boundary (2031)
- Entrance Location
- Mixed Use Proposed (NMU) (0.35 ha.)
- Mixed Use as per City of Barrie Secondary Plan (2.20 ha.)
- Stormwater Management Ponds/Drainage (0.14 ha.)
- Open Space (2.53 ha.)
- Enhanced Landscaping & Dual Sidewalks
- Enhanced Window Street
- Key Intersections (Enhanced treatments)
- Parcels with this symbol are Partial Lots/Blocks.

NOTES:

- Blue Dimensions are taken at the 3m Front Yard Setback.
- Black Dimensions (on lots) are taken at the 7m Front Yard Setback on regular and pie lots, or for reverse pie lots at the 5m Rear Yard Setback.
- Corner Lot Driveways are in accordance with the City of Barrie Transportation Design Manual:
  - 8.6m Clearance for 6.0m Driveway (Single Detached Lots)
  - 5.0m Clearance for 3.0m Driveway (Street Townhomes and Back to Back Lots)
- All Neighborhood Mixed Use (NMU) units are required to have 12m<sup>2</sup> of Private Amenity Area. Building footprints are required to confirm compliance.

| Preliminary Statistics                   | No. of Units | % of Total Units | Lot/Block Numbers |
|------------------------------------------|--------------|------------------|-------------------|
| 11.0m Single (36')                       | 112          | 18%              |                   |
| 11.0m Single End Unit (36')              | 49           | 8%               | 1 - 346           |
| 9.15m Single (30')                       | 185          | 30%              |                   |
| Street Townhome (7.0m) (23'/each)        | 172          | 28%              | Blocks 347 - 371  |
| Back to Back Townhomes (6.4m) (21'/each) | 68           | 11%              | Blocks 372 - 375  |
| Partial Lots/Blocks (Approx.)            | 28           | 5%               |                   |
| Total                                    | 614          | 100%             |                   |

Roads Breakdown:  
Major Collector Road 27.0m - STREET 'B' (Fenchurch Manor)  
Minor Collector Roads 24.0m - STREETS 'A' and STREETS 'C' (Lower Street)  
Local Roads 18.0m - STREET 'D' - STREET 'P'

SCALE 1 : 1500 (A1)

MATTAMY HOMES CANADA  
- LOCKHART -  
CONFORMITY REVIEW PLAN

Raymond J. Durand  
REGISTERED PROFESSIONAL PLANNER  
R.P.P.

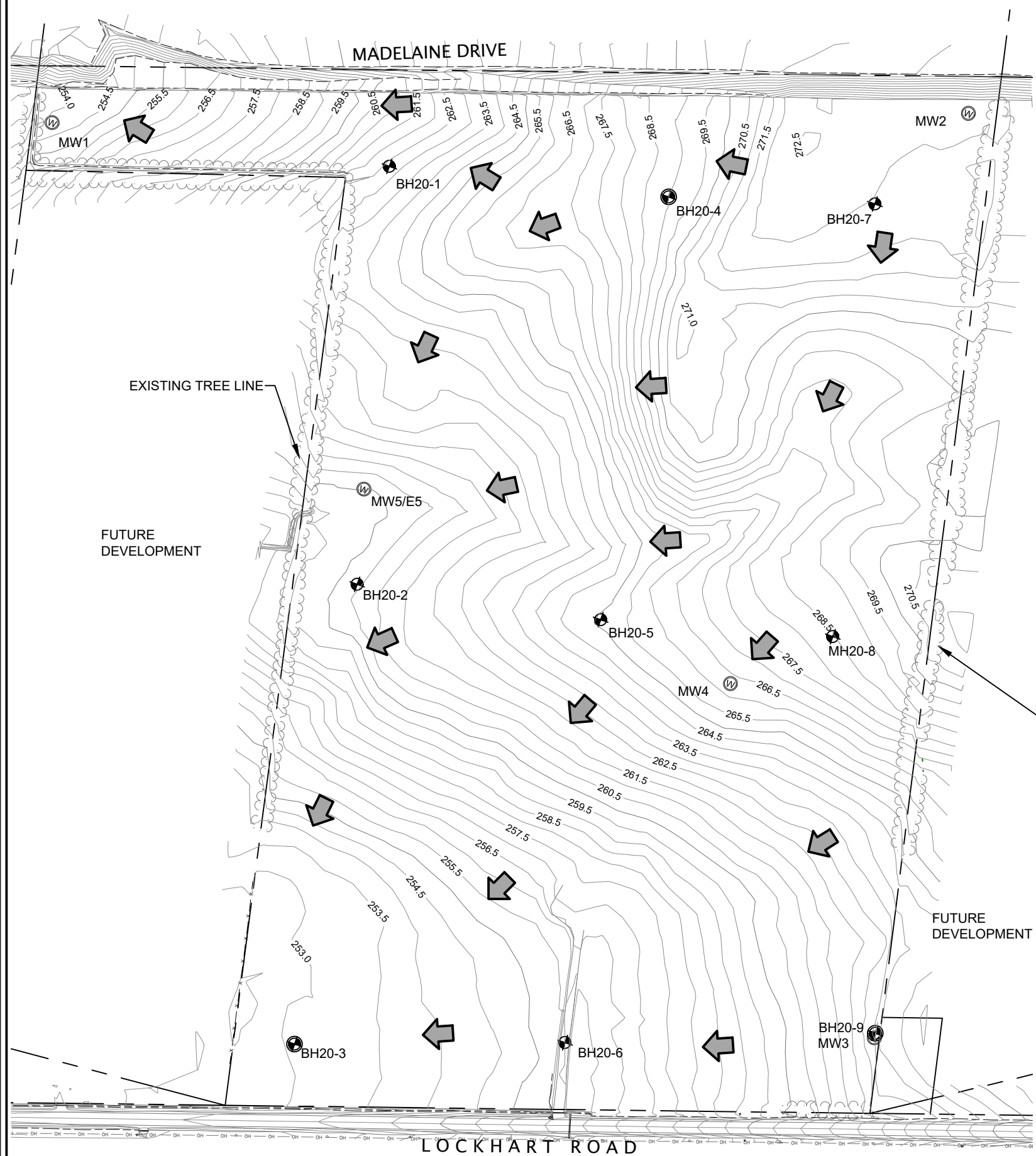
Date Issued: APRIL 29, 2021  
Checked By: RD  
Project No.: MAT-20542  
Drawn By: m.c.r.  
Drawing Name: MAT-20542-CP-5.dwg

JONES  
CONSULTING GROUP LTD.  
PLANNERS & ENGINEERS  
229 Mapleview Drive East, Unit 1, Barrie, Ontario L4N 6W5  
Phone: 705-734-2938 Fax: 705-734-1056  
www.jonesconsulting.com

FIG 2

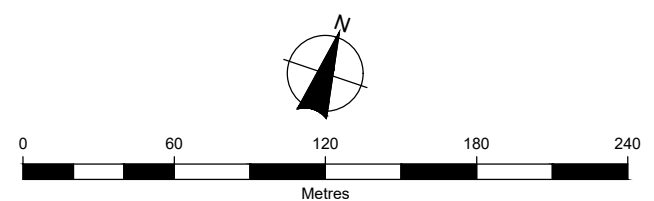
| SCHEDULE OF REVISIONS |             |       |
|-----------------------|-------------|-------|
| DATE                  | DESCRIPTION | DRAWN |
|                       |             |       |
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**LEGEND**

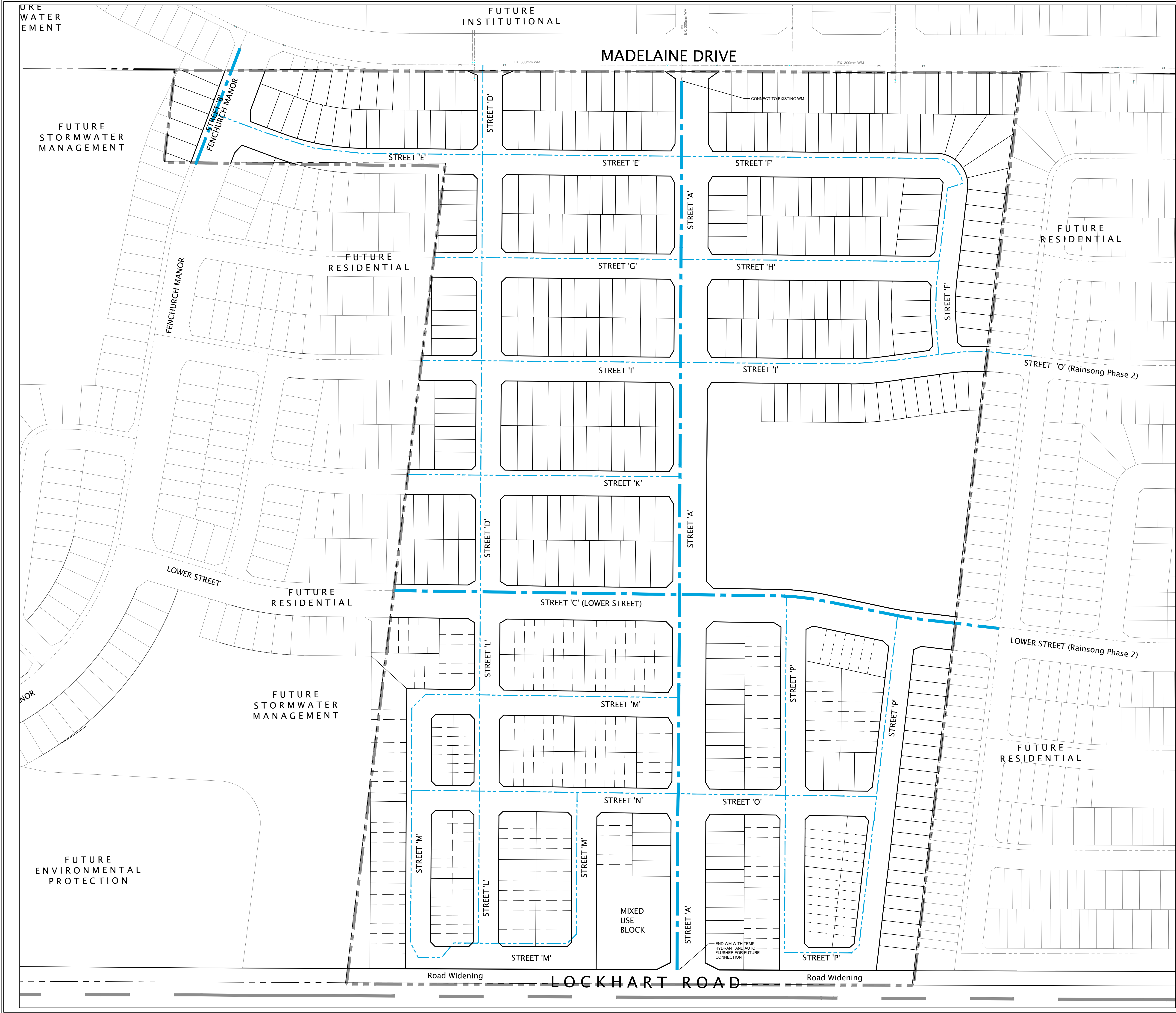
- OH — OH — OH — OH — OVERHEAD HYDRO LINES
- ~ ~ ~ ~ ~ TREE LINES
- x - x - x - EX. CHAIN LINK FENCE
- EX. CULVERT
- ⊕ EX. BOREHOLE
- ⊗ EX. WELL
- ➔ OVERLAND FLOW DIRECTIONS
- TOP OF SLOPE OF BANK
- - - - - BOTTOM OF SLOPE OF BANK
- . - . - DITCH



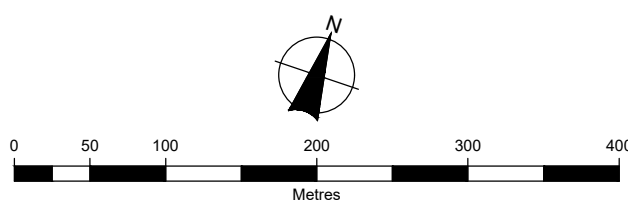
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|  BURNSIDE |                  | <div>Figure Title</div> <div>MATTAMY LOCKHART FSR</div> <div>EXISTING CONDITION PLAN</div> |             |          |            |
| Client                                                                                         | MATTAMY LOCKHART | Drawn                                                                                      | Checked     | Date     | Figure No. |
|                                                                                                |                  | LP                                                                                         | PH          | 21/06/23 |            |
|                                                                                                |                  | Scale                                                                                      | Project No. |          | FIG 3      |
|                                                                                                |                  | 1:3000                                                                                     | 300052092   |          |            |







- DC TRUNK WATERMAIN
- LOCAL TRUNK WATERMAIN
- LOCAL WATERMAIN
- WATERMAIN BY OTHERS
- SITE BOUNDARY



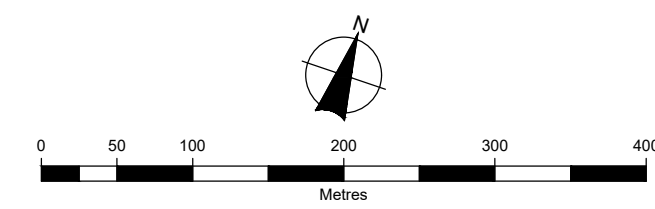
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|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------|-----------------------|----------------------------|
| <br>MATTAMY HOME | Figure Title<br><b>MATTAMY LOCKHART</b><br>WATERMAIN DISTRIBUTION PLAN |               |                       | Figure No.<br><b>FIG 5</b> |
|                                                                                                       | Drawn<br>PH                                                            | Checked<br>SW | Date<br>20/11/30      |                            |
|                                                                                                       | Scale<br>1:1250                                                        |               | Project No.<br>052092 |                            |





**LEGEND**

- AREA ID (RESIDENTIAL)
- AREA ID (MIXED USE)
- EXTERNAL AREA ID
- FUTURE AREA IN HECTARES
- FUTURE PROPOSED POPULATION
- CONTRIBUTING UNITS
- FLOW RATE (L/sec/ha)
- FLOW RATE (L/s/ha)
- TOTAL FLOW (l/s)
- PARK/SCHOOL AREA IN HECTARES
- SANITARY MANHOLE/SEWER
- SANITARY SEWER TRIBUTARY BOUNDARY
- SANITARY SERVICE



|                 |                 |                             |                            |
|-----------------|-----------------|-----------------------------|----------------------------|
| <b>BURNSIDE</b> |                 | <b>MATTAMY LOCKHART</b>     |                            |
| MATTAMY HOME    |                 | SANITARY DRAINAGE AREA PLAN |                            |
| Client          | Drawn<br>PH     | Checked<br>SW               | Date<br>20/11/30           |
|                 | Scale<br>1:1250 | Project No.<br>052092       | Figure No.<br><b>FIG 6</b> |

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**LEGEND**

- S36 SUBCATCHMENT I.D.  
0.26 0.3 RUNOFF COEFFICIENT  
DRAINAGE AREA IN HECTARES
- 1 CATCHMENT ID PER OUTLET POINT BASED ON SIS  
2.00 TOTAL DRAINAGE AREA IN HECTARES
- EXT 1 SUBCATCHMENT I.D.  
16.82 0.55 RUNOFF COEFFICIENT  
DRAINAGE AREA IN HECTARES
- S70 FUTURE SUBCATCHMENT I.D.  
0.36 0.3 RUNOFF COEFFICIENT  
DRAINAGE AREA IN HECTARES
- STORM SEWER TRIBUTARY BOUNDARY
- DRAINAGE BOUNDARY DIVIDED BY ULTIMATE OUTLET POINT
- PROPOSED OVERLAND FLOW DIRECTION
- FOUNDATION DRAIN CONNECT TO STM PIPE SEE DETAIL BELOW FOR REFERENCE

**NOTES**

- ALL PLUMBING TO CONFORM TO ONTARIO BUILDING CODE.
- STORM SEWERS SHALL BE CONSTRUCTED WITH BUILDING AS PER CPD 802.015 (GRAN. IN EMBEDED MATERIAL) FOR FLEXIBLE PIPES AND CPD 802.015 OR 802.031 CLASS B (GRAN. IN BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF ENGINEERING.
- REQUIRES ASB TO PVC ADAPTER CONNECTION.
- POLYVINYL CHLORIDE SEWER PIPE (PVC) STORM PIPE (PVC) 110mm x 125mm x 125mm x 125mm.
- APPROXIMATE BUTADIENE-STYRENE (ABS) PIPE 110mm x 125mm.

**SUMP PUMP DISCHARGE CONNECTION TO STORM SEWER**

NTS

**BURNSIDE**

RJB 1.01

**BURNSIDE**

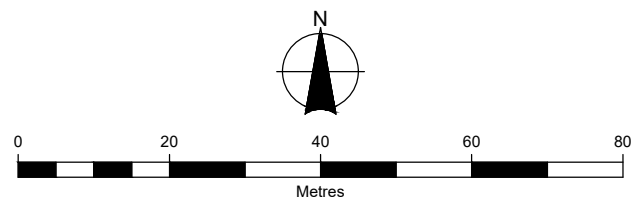
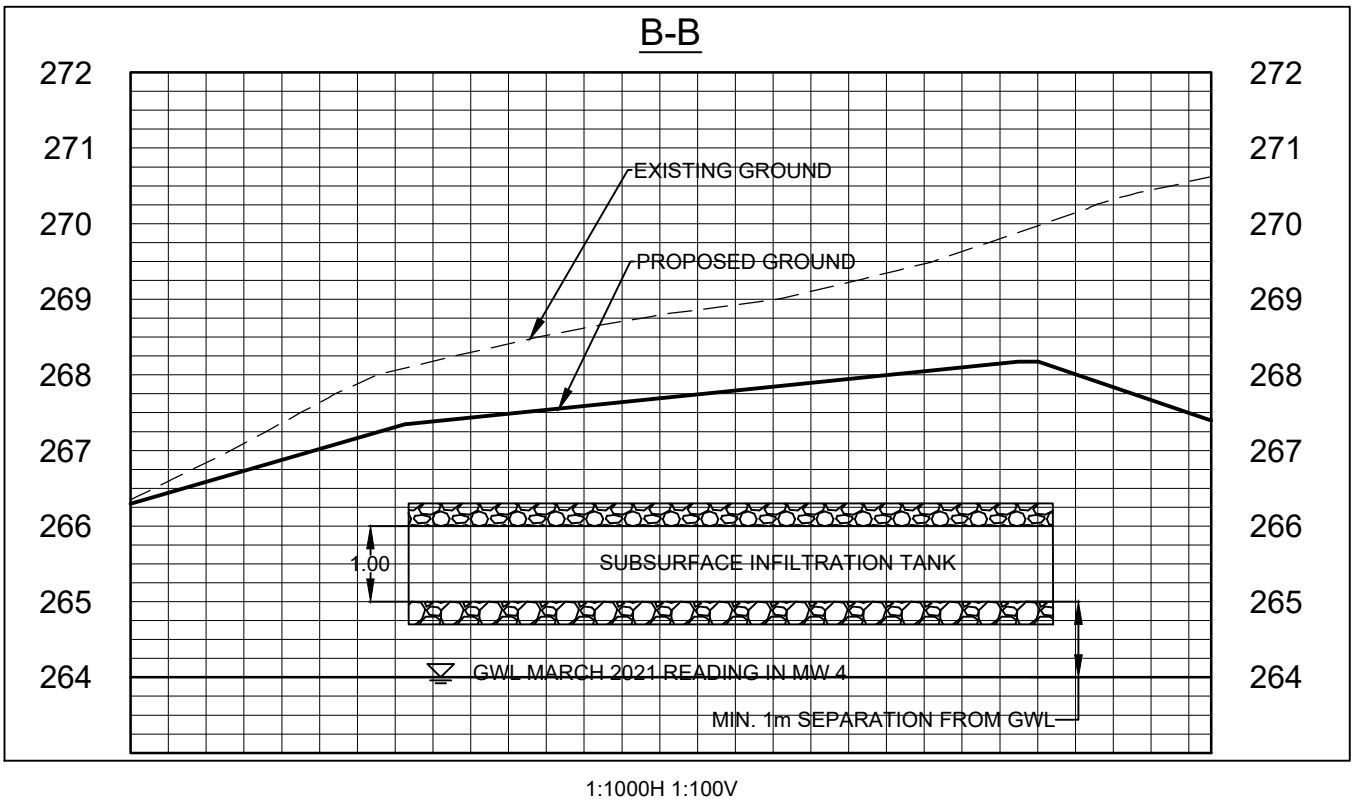
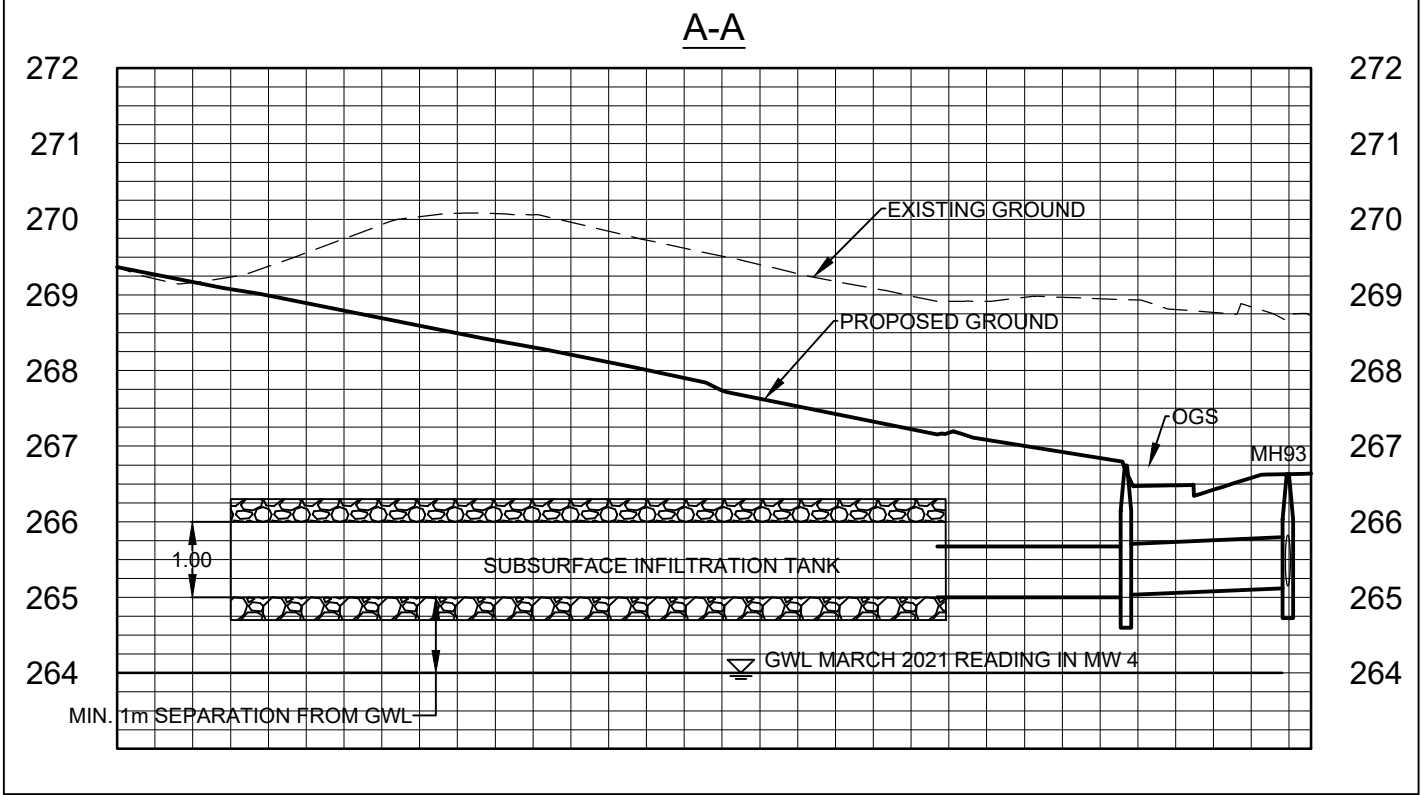
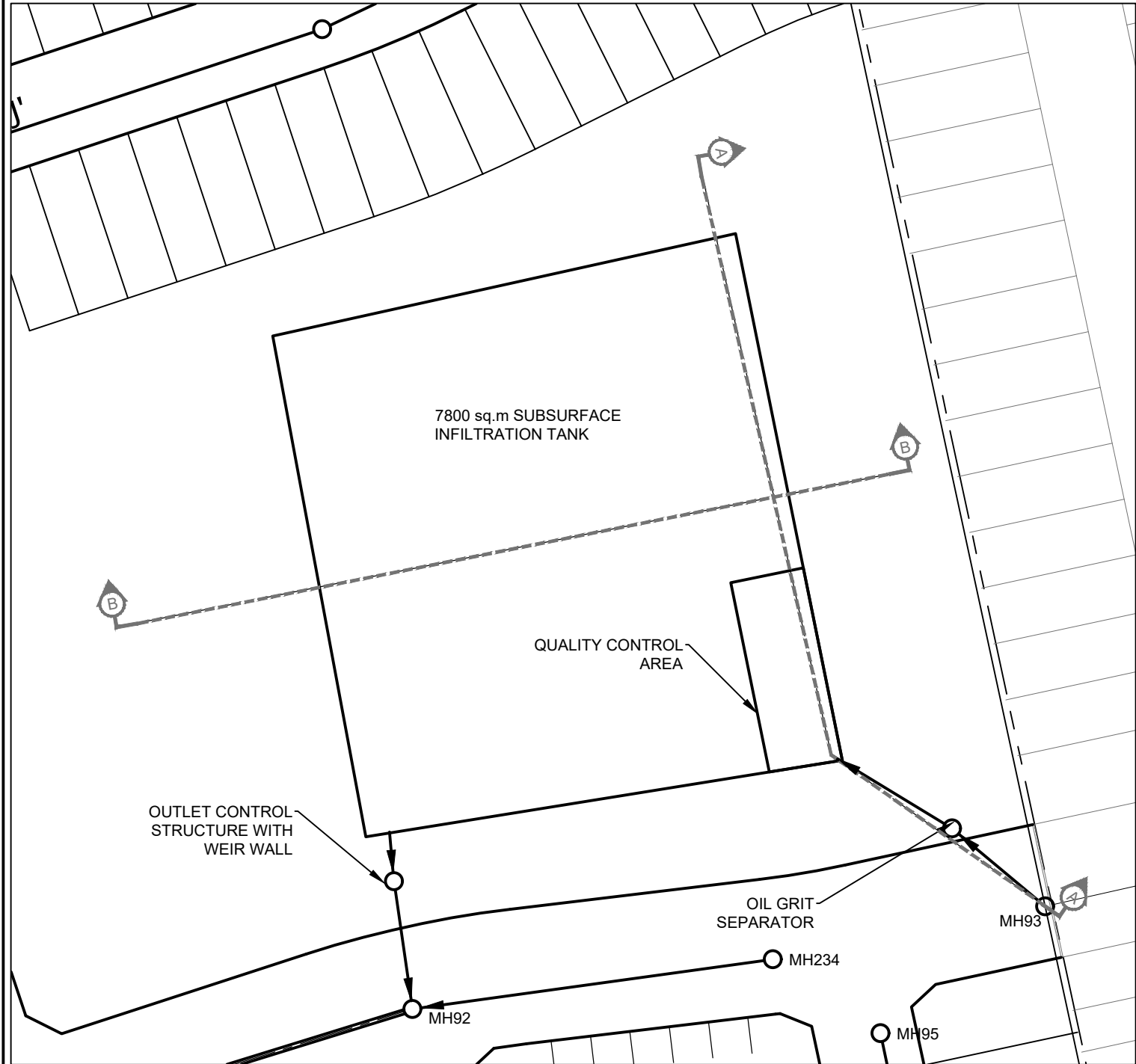
**MATTAMY HOME**

Client

Figure Title: **MATTAMY LOCKHART**  
STORM DRAINAGE AREA PLAN

Drawn: PH  
Checked: SW  
Date: 20/11/30  
Scale: 1:1250  
Project No.: 052092

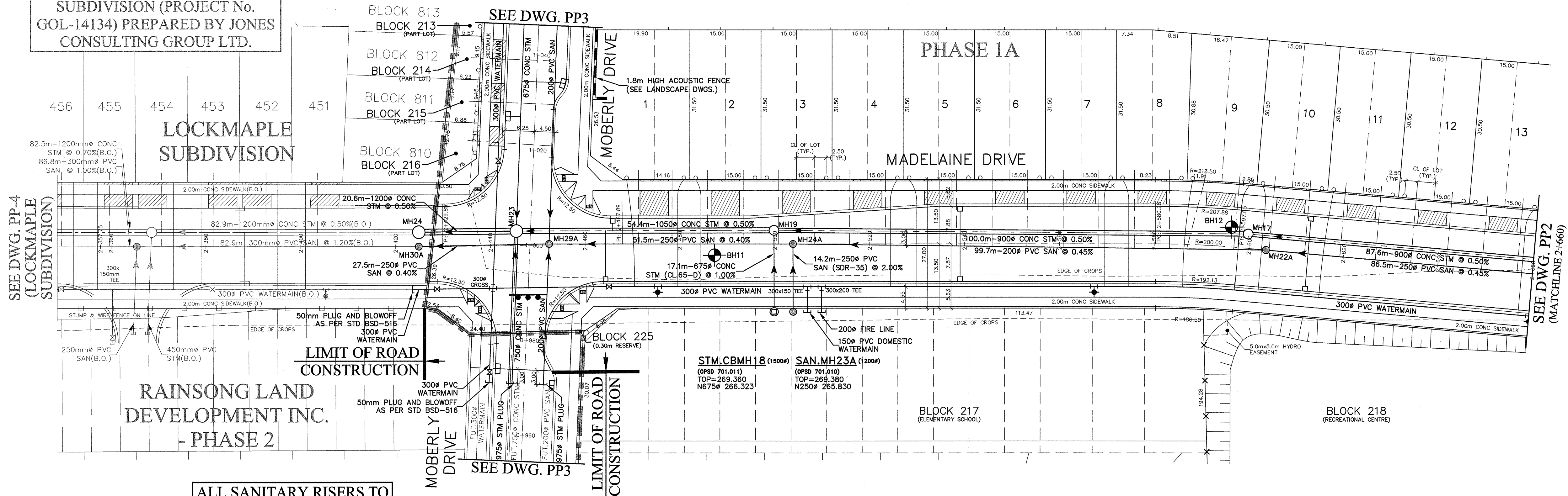
Figure No.: **FIG 7**



|                     |  |                                                         |             |              |
|---------------------|--|---------------------------------------------------------|-------------|--------------|
|                     |  | Figure Title                                            |             |              |
|                     |  | <b>MATTAMY LOCKHART</b><br>SUBSURFACE INFILTRATION TANK |             |              |
| Client              |  | Drawn                                                   | Checked     | Date         |
|                     |  | PH                                                      | SW          | 20/11/30     |
| <b>MATTAMY HOME</b> |  | Scale                                                   | Project No. |              |
|                     |  | 1:1000                                                  | 052092      |              |
|                     |  |                                                         |             | Figure No.   |
|                     |  |                                                         |             | <b>FIG 8</b> |

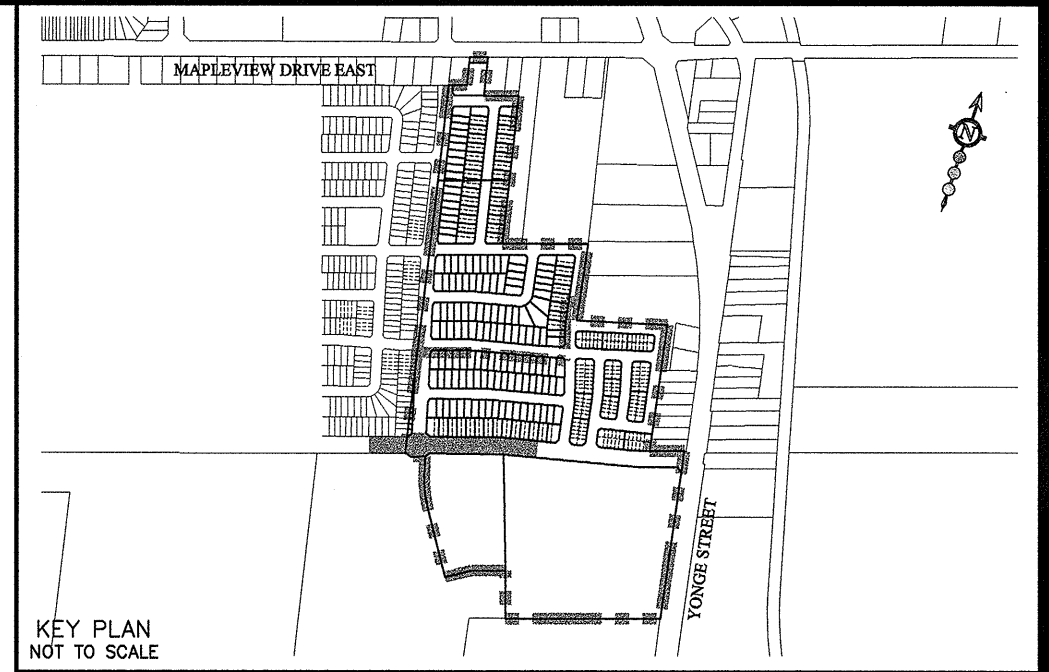
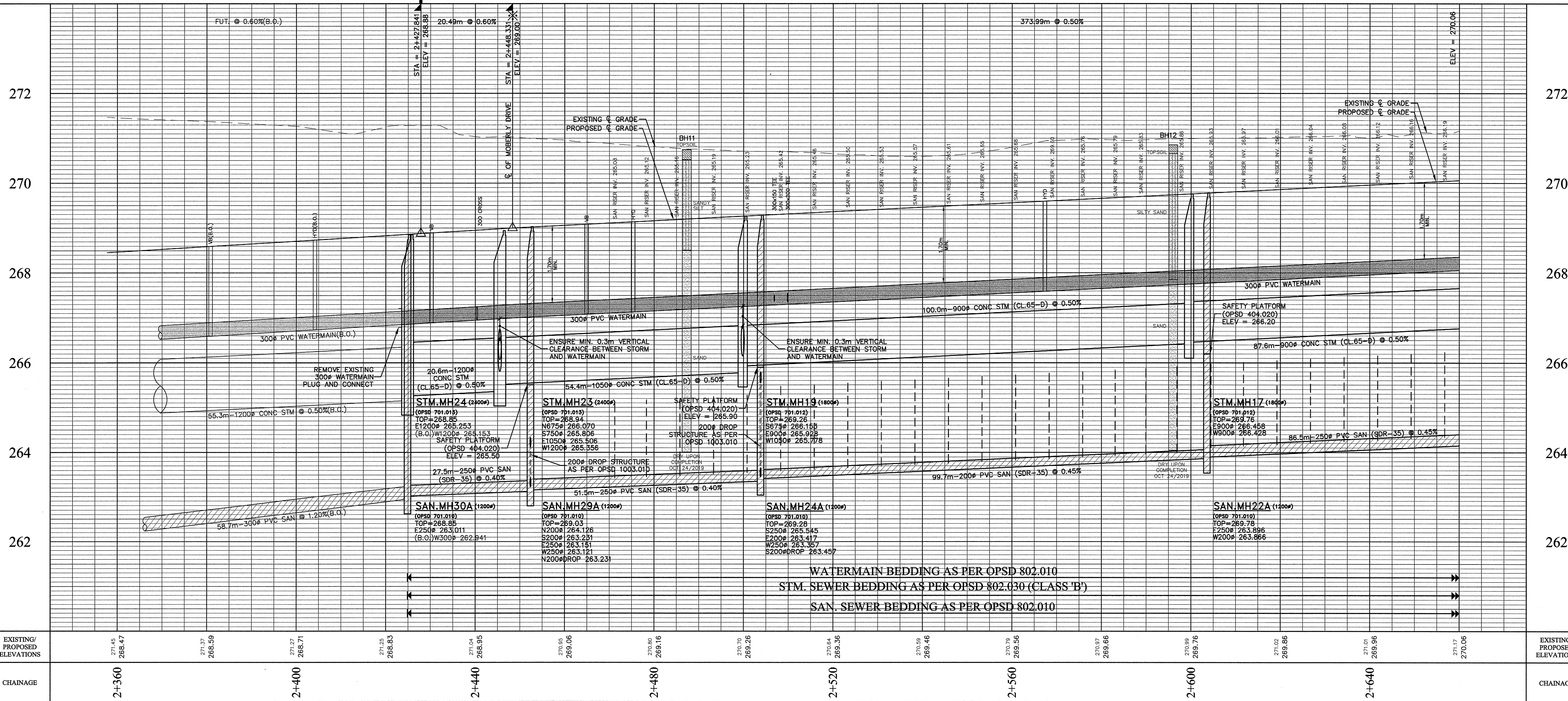


REFER TO LOCKMAPLE INNISFIL INVESTMENTS LTD. LOCKMAPLE SUBDIVISION (PROJECT NO. GOL-14134) PREPARED BY JONES CONSULTING GROUP LTD.



ALL SANITARY RISERS TO BE INSTALLED AS PER DETAIL ON DWG. DET3

LIMIT OF ROAD CONSTRUCTION



- LEGEND**
- LIMIT OF EAST SUBDIVISION
  - LIMIT OF PHASE
  - SANITARY MANHOLE/SEWER
  - STORM MANHOLE/SEWER
  - SINGLE CATCHBASIN WITH NO ICD
  - DOUBLE CATCHBASIN WITH NO ICD
  - HYDRANT AND VALVE
  - HYDRANT AND VALVE (BY-OTHERS)
  - VALVE BOX
  - VALVE BOX (BY-OTHERS)
  - WATER SERVICE BOX LOCATION (WATER SERVICE AT 90° TO WATERMAIN UNLESS OTHERWISE SHOWN)
  - SINGLE SANITARY (MIN. 100mm PVC) CONNECTION AS PER CITY OF BARRIE STD. BSD-25
  - LOT/BLOCK NUMBER
  - TEMPORARY DEAD END BARRICADE
  - PROPOSED EMBANKMENT (MAX. 3:1 UNLESS OTHERWISE NOTED)
  - PRIVACY FENCE (SEE LANDSCAPE DWGS FOR DETAILS)
  - 1.8m HIGH ACOUSTIC FENCE (UNLESS OTHERWISE NOTED) (SEE LANDSCAPE DWGS FOR DETAILS)
  - CHAINLINK FENCE (SEE LANDSCAPE DWGS FOR DETAILS)
  - BH8 BOREHOLE LOCATION
  - RAISED INTERSECTION MARKINGS

**NOTES:**

- ALL LOTS TO BE EQUIPPED WITH SUMP PUMPS (SEE DETAIL ON DET SERIES DRAWINGS)

TOPOGRAPHIC SURVEY PROVIDED BY RUDY MAK SURVEYING LTD. (SEPTEMBER 2019)

**BENCH MARKS**

**BENCHMARK NOTE**  
SITE BENCHMARK IS THE SPECIFIED CONTROL MONUMENT 03120110014 HAVING AN ELEVATION OF 268.68.

**ELEVATION NOTE**  
ELEVATION ARE GEODETIC IN ORIGIN AND WERE DERIVED FROM SPECIFIED CONTROL POINTS 03120110014 (ELEVATION=268.68, CGVD-1928:1978) AND 03120110013 (ELEVATION=262.81, CGVD-1928:1978).

**BEARING NOTE**  
BEARINGS ARE UTM GRID, DERIVED FROM SPECIFIED CONTROL POINTS 03120110014 AND 03120110013, UTM ZONE 17, NAD 83 (ORIGINAL).

FOR BEARING COMPARISONS, A ROTATION OF 0°56'55" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 51R-35034.

| NO. | REVISIONS | DATE | APPROVED |
|-----|-----------|------|----------|
|     |           |      |          |
|     |           |      |          |
|     |           |      |          |
|     |           |      |          |

**CITY OF BARRIE**  
**ACCEPTED**  
DATE: .....  
DIRECTOR OF ENGINEERING

**scs consulting group ltd**  
30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335

**GREAT GULF**  
3751 VICTORIA PARK AVENUE  
TORONTO, ONTARIO M1W 3Z4  
TEL: (416) 449-1340  
FAX: (416) 449-6438

**RAINSONG LAND DEVELOPMENT INC. - PHASE 1**  
**RAINSONG DEVELOPMENT - BARRIE**

**MADELAINE DRIVE**  
**STA. 2+357 TO 2+660**

**Barrie**  
**ENGINEERING DEPARTMENT**

**SCALE**  
HORIZ. 1:500  
VERT. 1:50  
**DESIGN** R.S.H./M.A.M.  
**REVIEWED** M.R.C./P.S.

**CONTRACT NO.** 1900  
**SHEET NO.** PP1  
**DATE** NOVEMBER 2019



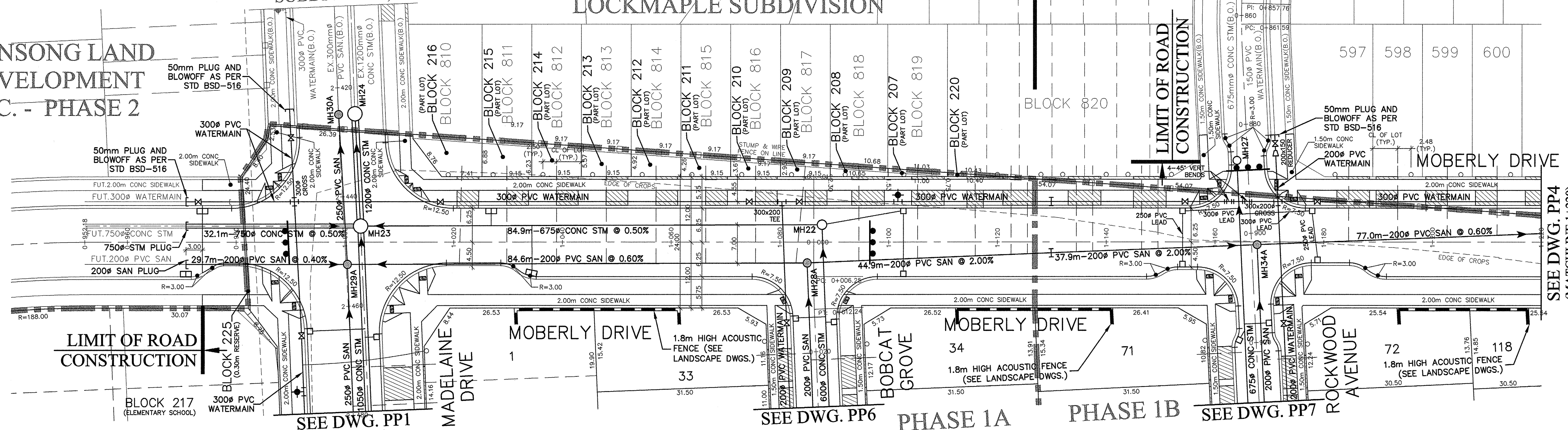
RAINSONG LAND  
DEVELOPMENT  
INC. - PHASE 2

REFER TO LOCKMAPLE INNISFIL  
INVESTMENTS LTD. LOCKMAPLE  
SUBDIVISION (PROJECT No.  
GOL-14134) PREPARED BY JONES  
CONSULTING GROUP LTD.

LOCKMAPLE SUBDIVISION

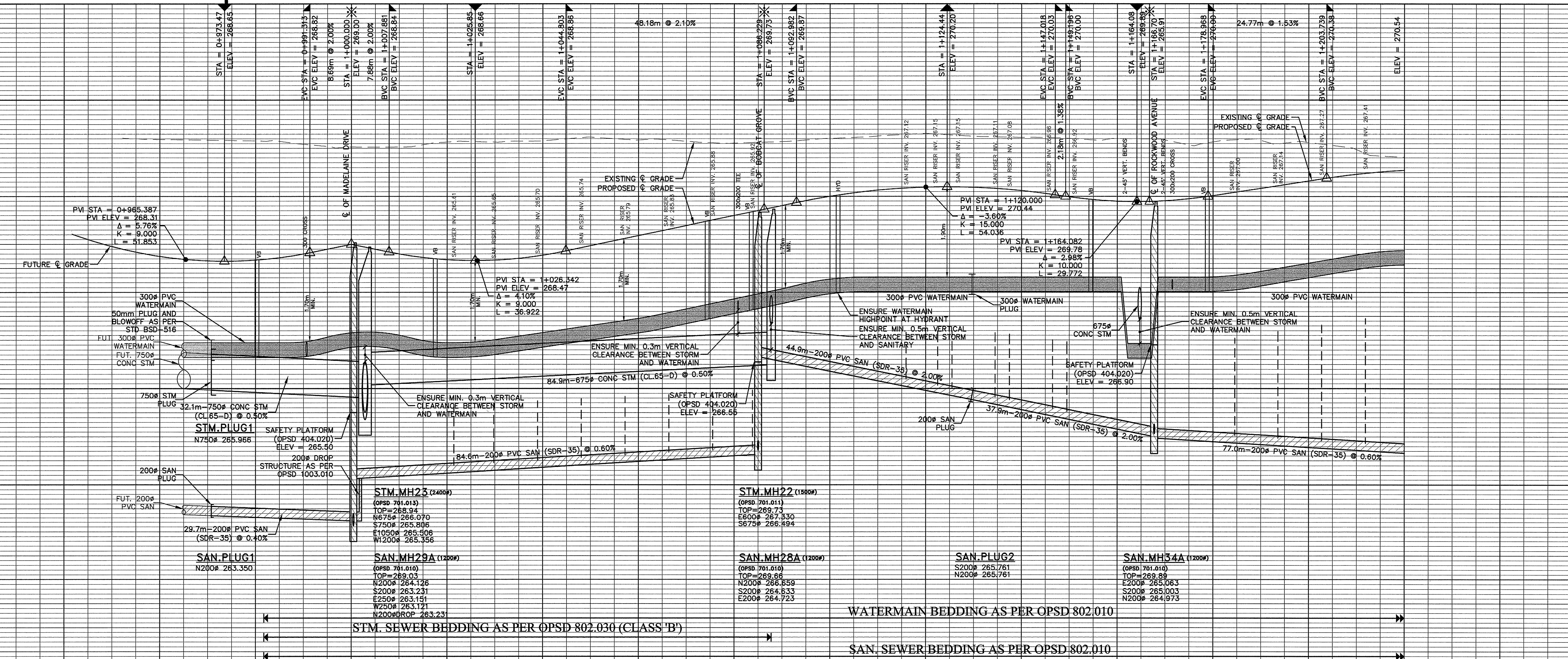
LIMIT OF ROAD PHASE 1A  
CONSTRUCTION

SEE DWG. PP-28  
(LOCKMAPLE  
SUBDIVISION)

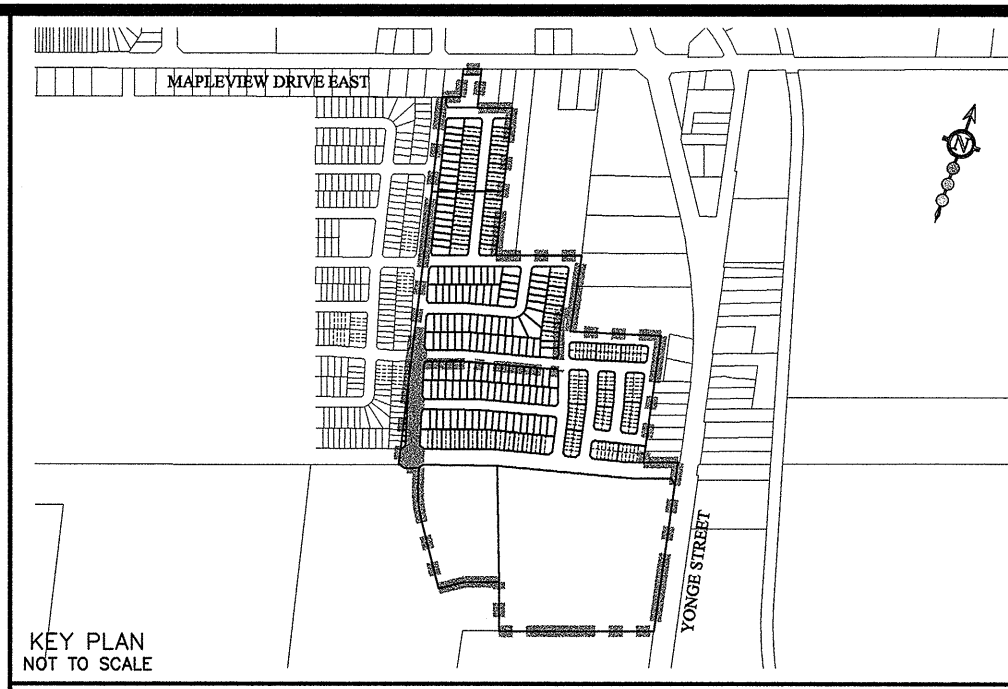


ALL SANITARY RISERS TO  
BE INSTALLED AS PER  
DETAIL ON DWG. DET3

LIMIT OF ROAD  
CONSTRUCTION



| EXISTING/<br>PROPOSED<br>ELEVATIONS | 272<br>270<br>268<br>266<br>264<br>262                      | 272<br>270<br>268<br>266<br>264<br>262              |
|-------------------------------------|-------------------------------------------------------------|-----------------------------------------------------|
| CHAINAGE                            | 0+960<br>1+000<br>1+040<br>1+080<br>1+120<br>1+160<br>1+200 | EXISTING/<br>PROPOSED<br>ELEVATIONS<br><br>CHAINAGE |



| LEGEND | LIMIT OF EAST SUBDIVISION<br>LIMIT OF PHASE<br>SANITARY MANHOLE/SEWER<br>STORM MANHOLE/SEWER<br>SINGLE CATCHBASIN WITH NO ICD<br>DOUBLE CATCHBASIN WITH NO ICD<br>HYDRANT AND VALVE<br>HYDRANT AND VALVE (BY-OTHERS)<br>VALVE BOX<br>VALVE BOX (BY-OTHERS)<br>WATER SERVICE BOX LOCATION (WATER SERVICE AT<br>90° TO WATERMAIN UNLESS OTHERWISE SHOWN)<br>SINGLE SANITARY (MIN. 100mm PVC) CONNECTION<br>AS PER CITY OF BARRIE STD. B25-25<br>LOT/BLOCK NUMBER<br>TEMPORARY DEAD END BARRICADE<br>PROPOSED EMBANKMENT<br>(MAX. 3:1 UNLESS OTHERWISE NOTED)<br>PRIVACY FENCE<br>(SEE LANDSCAPE DWGS FOR DETAILS)<br>1.8m HIGH ACOUSTIC FENCE (UNLESS OTHERWISE<br>NOTED) (SEE LANDSCAPE DWGS FOR DETAILS)<br>CHAINLINK FENCE<br>(SEE LANDSCAPE DWGS FOR DETAILS)<br>BOREHOLE LOCATION<br>RAISED INTERSECTION MARKINGS |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

NOTES:  
• ALL LOTS TO BE EQUIPPED WITH SUMP PUMPS (SEE DETAIL  
ON DET SERIES DRAWINGS)

TOPOGRAPHIC SURVEY PROVIDED BY RUDY MAK SURVEYING LTD. (SEPTEMBER 2019)

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APPLIED TO BEARINGS ON PLAN 51R-35034.

| NO. | REVISIONS | DATE | APPROVED |
|-----|-----------|------|----------|
|     |           |      |          |
|     |           |      |          |
|     |           |      |          |

CITY OF BARRIE  
ACCEPTED  
DATE: .....  
DIRECTOR OF ENGINEERING

30 CENTURIUM DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 9B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335  
  
3751 VICTORIA PARK AVENUE  
TORONTO, ONTARIO M1W 3Z4  
TEL: (416) 449-1340  
FAX: (416) 449-6438

RAINSONG LAND  
DEVELOPMENT INC.-PHASE 1  
RAINSONG DEVELOPMENT  
- BARRIE

MOBERLY DRIVE  
STA. 0+952 TO 1+220

Barrie  
ENGINEERING DEPARTMENT

SCALE: HORIZ. 1:500 VERT. 1:50  
DESIGN: R.S.H./M.A.M. DRAWN: M.J.O.  
REVIEWED: M.R.C./P.S. DATE: NOVEMBER 2019

CONTRACT NO. 1900  
SHEET NO. PP3



**Mr. Andrew Gameiro**  
City of Barrie  
City Hall, 70 Collier Street, P.O. Box 400  
Barrie, Ontario, L4M 4T5

Dear Mr. Gameiro:

**Re: Stormwater Management Compliance Brief  
Rainsong Development Inc. – Phase 2  
City of Barrie**

We are pleased to provide the following stormwater compliance brief in support of the conformity exercise for the proposed development.

The proposed development, as illustrated on the conformity plan provided by Jones Consulting Group Inc. (**Attachment A**), is located in the Hewitt's Secondary Plan area within the City of Barrie. A Subwatershed Impact Study (SIS) was completed in support of the Hewitt's Secondary Plan, and has since been approved.

We note that the proposed plan, as outlined in the SIS, is to convey stormwater runoff to three proposed stormwater management facilities that are on lands owned by others: SWMF #3 (Lockhart Innsifil), SWMF #4 (Lockmaple) and SWMF #5 (Ballymore Barrie). SWMF #4 and SWMF #5 have completed design charrettes and the proposed drainage from the proposed development is consistent with what has been assumed to date.

The majority of the proposed development conveys stormwater to SWMF #3 to the west, located within the Lockhart Innsifil lands. Between the proposed development and SWMF #3 are the Irving lands. The Irving lands to the west are currently not part of the cost sharing group and therefore not participating. A design charrette will be completed in partnership with the future owner of the lands west of the proposed development. The stormwater management strategy in support of the proposed development, as will be documented through the future design charrette, will confirm that the proposed stormwater solution for the proposed development is in conformance with the approved SIS.

Re: Stormwater Management Compliance Brief  
Rainsong Development Inc. – Phase 2  
City of Barrie

File #: 1964  
December 16, 2019  
Page 2 of 2

Please contact the undersigned if you have any questions or require any additional information.

Sincerely,

**SCS Consulting Group Ltd.**



John Priamo, P.Eng.  
jpriamo@scsconsultinggroup.com

Attachments: Attachment A – Conformity Plan, KLM Planning

- c. Mr. F. Palka, City of Barrie
- Mr. R. Duhamel, Jones Consulting
- Ms. K. Schofield, Great Gulf

P:\1900 Rainsong Development - Barrie\Correspondence\Letters\Barrie-2019 12(Dec) 16-jmp-Conformity with SIS.docx



**File #:** 1900  
**Date:** February 4<sup>th</sup>, 2022

**Mr. Andrew Gameiro**

City of Barrie  
City Hall, 70 Collier Street, P.O. Box 400  
Barrie, Ontario, L4M 4T5

Dear Mr. Gameiro:

**Re:                   Linear Infrastructure  
                      Rainsong Development Inc. - Phase 2  
                      City of Barrie**

We are pleased to provide the following summary of linear infrastructure in support of the conformity exercise for the proposed development.

The proposed development, as illustrated on the Draft Plan provided by Jones Consulting Group Inc. in this submission package, the site is located in the Hewitt's Secondary Plan area within the City of Barrie. The following summarizes the preliminary infrastructure requirements based on the Draft Plan & Functional Servicing and Stormwater Management Report, dated February 2022:

Right-Of-Way

- Roads
  - Local – 2072.73 m
  - Collector – 926.34 m
- Sidewalks – 3475.74 m

Sewers

- Sanitary
  - Local – 3005.54 m
- Water
  - Local Trunk – 661.54 m
  - Local – 2337.53 m
- Storm
  - Local – 2972.02 m

Re: | **Linear Infrastructure**  
| **Rainsong Development Inc. - Phase 2**  
| **City of Barrie**

File #: 1900  
February 4th, 2022  
Page 2 of 2

Please contact the undersigned if you have any questions or require any additional information.

Sincerely,

**SCS Consulting Group Ltd.**

A handwritten signature in black ink, appearing to read 'Michael Ventresca', with a long horizontal flourish extending to the right.

Michael Ventresca, P.Eng.  
mventresca@scsconsultinggroup.com



# MEETING MINUTES

**File #:** 2000  
**Date:** August 28, 2020

|                       |                                                       |
|-----------------------|-------------------------------------------------------|
| Project:              | <b>Rainsong - Phase 2 (Rainsong Development Inc.)</b> |
| Purpose:              | <b>Design Charrette</b>                               |
| Date/Time of Meeting: | <b>July 28th, 1:00 PM</b>                             |
| Location:             | <b>Zoom Virtual Meeting Room</b>                      |

| Attendees:                          | Recipient(s): | Email:                                                                                 |
|-------------------------------------|---------------|----------------------------------------------------------------------------------------|
| Andrew Gameiro, City of Barrie      |               | <a href="mailto:andrew.gameiro@barrie.ca">andrew.gameiro@barrie.ca</a>                 |
| Nadine Rush                         |               | <a href="mailto:Nadine.rush@barrie.ca">Nadine.rush@barrie.ca</a>                       |
| Caroline Hawson, LSRCA              |               | <a href="mailto:c.hawson@LSRCA.on.ca">c.hawson@LSRCA.on.ca</a>                         |
| Melinda Bessey, LSRCA               |               | <a href="mailto:m.bessey@LSRCA.on.ca">m.bessey@LSRCA.on.ca</a>                         |
| Kenneth Cheney, LSRCA               |               | <a href="mailto:k.cheney@LSRCA.on.ca">k.cheney@LSRCA.on.ca</a>                         |
| Trish Elliot, Great Gulf            |               | <a href="mailto:trish.elliott@greatgulf.com">trish.elliott@greatgulf.com</a>           |
| Katy Schofield, Great Gulf          |               | <a href="mailto:katy@greatgulf.com">katy@greatgulf.com</a>                             |
| Marc Tremblay, SCS Consulting Group |               | <a href="mailto:mtremblay@scsconsultinggroup.com">mtremblay@scsconsultinggroup.com</a> |
| John Priamo, SCS Consulting Group   |               | <a href="mailto:jpriamo@scsconsultinggroup.com">jpriamo@scsconsultinggroup.com</a>     |

The following is considered to be a true and accurate record of the items discussed. Any errors or omissions in these minutes should be provided in writing to the author immediately.

## **Item:**

### **1.0 Existing Site Conditions**

- 1.1 A ridge is located along the centre of the site running east-west. The ridge slopes to a draw falling to the west in the south portion of the site. North of the ridge, the site slopes to a localized low point. An additional small draw is located on the northernmost portion of the site.
- 1.2 Soils consist of silt/clay/till overlying sand/silt with hydraulic conductivity ranging from 78 to 119 mm/hr.
- 1.3 Groundwater ranges from 3 m to 8 m below existing grade.

## **2.0 Sub-watershed Impact Study (SIS) Criteria**

- 2.1 School block assumed to provide best efforts infiltration on-site.
- 2.2 25 mm of filtration over impervious areas is required.
- 2.3 Best efforts are required for infiltration.
- 2.4 “Enhanced” TSS Protection
- 2.5 Phosphorus – Greater of:
  - Match existing loading rates to the extent feasible
  - 80% Reduction in Proposed Phosphorus Loading Rates
  - Goal is “zero” export

## **3.0 Proposed Conditions**

- 3.1 Grading to conform generally to SIS. Majority of site to drain to SWMF#3, north portion of the site to drain to SWMF#4, and east portion of the school block to drain to SWMF#5
- 3.2 Proposed elevations generally more than 4 metres above groundwater throughout with a portion in the southwest 2-4 metres above.

## **4.0 Potential Low Impact Developments (LIDs)**

- 4.1 Rain Garden accept surface drainage. Appropriate for side flankages.
- 4.2 Right of way (ROW) infiltration trench – Below ground trench where soils can support infiltration with separation from groundwater. Trenches would collect roof drainage from a portion of the roof as well as foundation drainage.

## **5.0 Stormwater Management Solutions**

- 5.1 Design charrettes have been completed for lands containing lands containing SWMF#4 and SWMF#5 and the portion of the proposed development proposed to drain to these SWM facilities has been accounted for downstream.
- 5.2 A suite of potential LIDs was presented illustrating all possible locations for LIDs throughout the development (see attached). As shown, rain gardens are feasible on all lot flankages on local roads within the portion of the site in the proposed condition. ROW infiltration trenches are feasible on local roads in front of single and semi-detached lots.
- 5.3 While these LID measures have been determined feasible based on the preliminary soils and groundwater information, it is preferred that the volume control targets for the portion of the site proposed to drain to SWMF #3 are achieved through centralized LID facilities located in the downstream SWMF#3 pond block and parks located in the neighbouring property to the west.
- 5.4 School block to provide volume control on site.

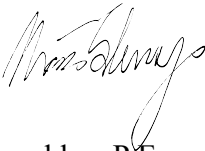




## **6.0 Stormwater Management Solution Discussions**

- |     |                                                                                                                                                                                                                                                    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.1 | Rain gardens to be designed per Barrie criteria and associated surface depressions to achieve the necessary offset from back of curb.                                                                                                              |
| 6.2 | Proposed drainage boundaries which identify the proposed watershed diversion between Hewitt's and Lover's Creek were reviewed and found to be acceptable to the LSRCA.                                                                             |
| 6.3 | Caroline (LSRCA) noted that post to pre water balance to be achieved on site to the extent feasible.                                                                                                                                               |
| 6.4 | No opposition posed to LIDS based in the municipal ROW.                                                                                                                                                                                            |
| 6.5 | Ken (LSRCA) noted that infiltration facilities for the portion of the proposed development proposed to drain to SWMF #4/#5 are to be explored as an option for providing additional infiltration to offset the required minor watershed diversion. |
| 6.6 | Infiltration testing to be conducted at the base elevations of any proposed LID facilities to ensure accurate estimation of infiltration rate.                                                                                                     |

## **SCS Consulting Group Ltd.**



Marc Tremblay, P.Eng.  
mtremblay@scsconsultinggroup.com

Attachments: Presentation

P:\2000 Barrie Lockhart Road - Sorbara\Correspondence\Minutes of Meetings\2018 07(Jul)06 - Meeting Minutes\2000 - Design Charrette Minutes \_ MT.docx

# Design Charrette

*Rainsong Phase 2 – Great Gulf*



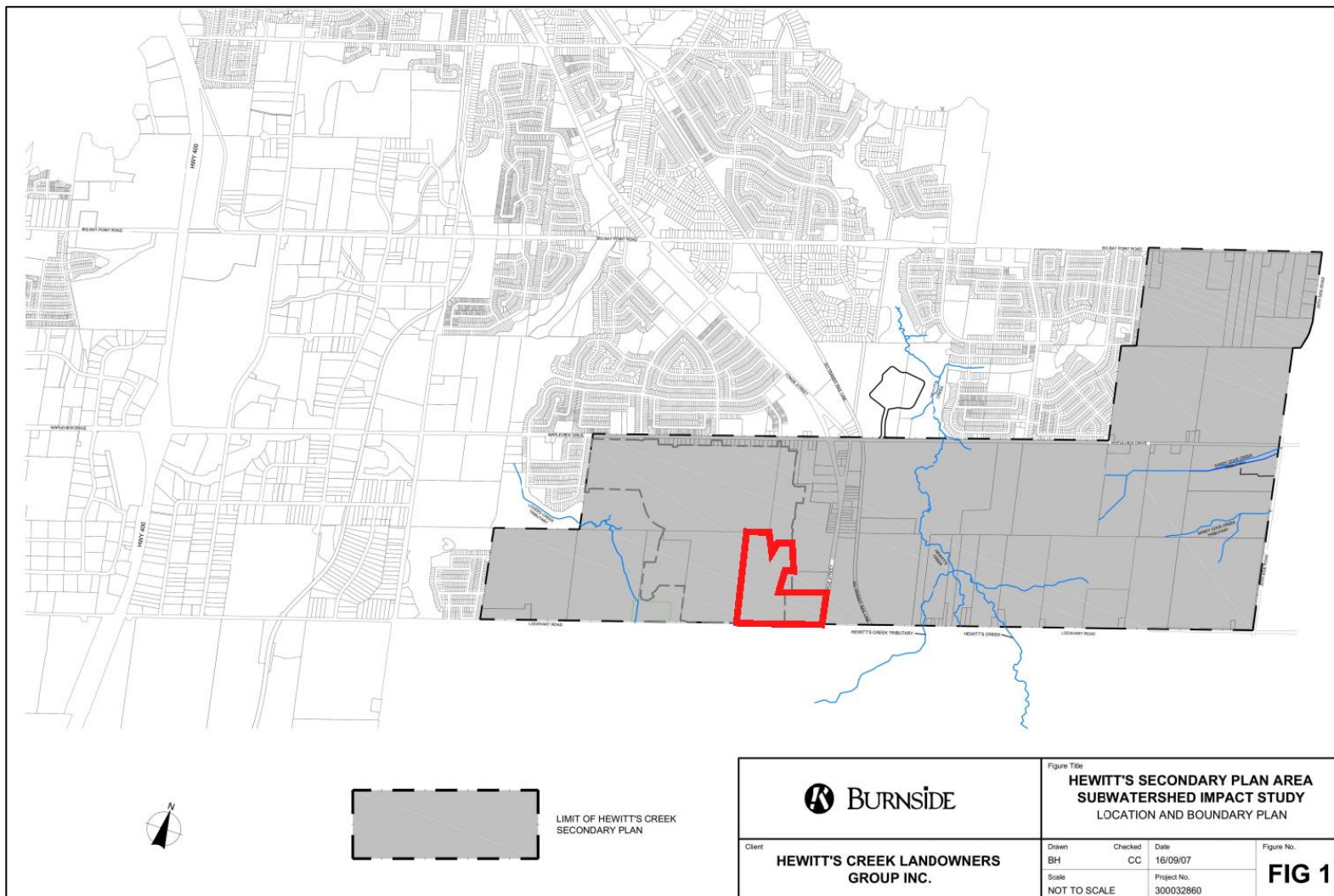


- Review Existing Site Conditions
- Review Approved Criteria at Secondary Plan Level
- Review Proposed Conditions
- Review & Brainstorm Potential Solutions

**Purpose: Develop Stormwater Management Solution acceptable to all parties which provides treatment as prescribed through all applicable policies, criteria and standards.**



# Hewitt's Secondary Plan - Area





# Existing Conditions



# Existing Topography





# Existing Soils

- The site is generally composed of silt/clay till overlying sand/silt
- Hydraulic Conductivity from  $1.3 \times 10^{-3}$  cm/s to  $6.3 \times 10^{-3}$  cm/s (infiltration rate 78-119 mm/hr) per RS-1 and RS-3d (within Phase 2)

**Table 3: Single Well Response Testing Results**

| Monitoring Well | Screen Interval (mbgs)* | Formation Screened             | Hydraulic Conductivity (cm/sec) |
|-----------------|-------------------------|--------------------------------|---------------------------------|
| RS-1            | 6.1 – 8.4               | Sand                           | $1.3 \times 10^{-3}$            |
| RS-3d           | 8.5 – 10.7              | Sand, trace silt, trace gravel | $6.3 \times 10^{-3}$            |
| RS-4            | 8.5 – 10.7              | Sand, some silt, trace clay    | $2.5 \times 10^{-4}$            |
| RS-6            | 7.0 – 9.1               | Sand, trace silt, trace gravel | $3.4 \times 10^{-3}$            |

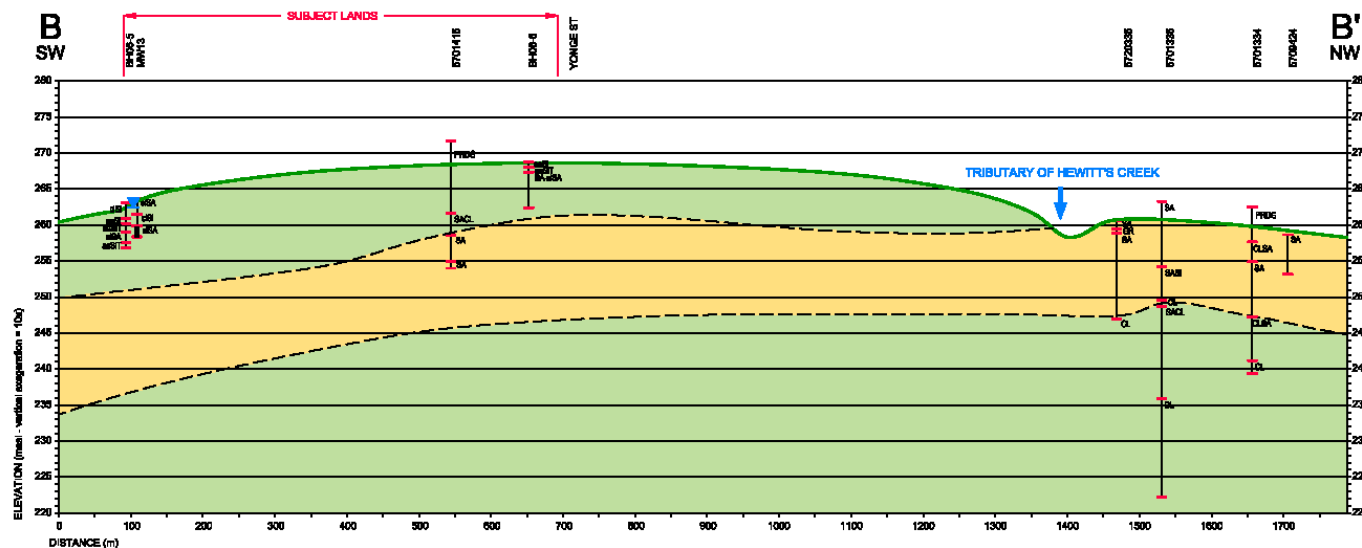
\*metres below ground surface







# Existing Soils



## LEGEND

- |     |                  |      |                          |
|-----|------------------|------|--------------------------|
| BH1 | WELL NUMBER / ID | si   | SILTY                    |
|     |                  | sa   | SANDY                    |
|     |                  | ci   | CLAYEY                   |
|     |                  | GR   | GRAVEL                   |
|     |                  | SA   | SAND                     |
|     |                  | SI   | SILT                     |
|     |                  | CL   | CLAY                     |
|     |                  | T    | TILL                     |
|     |                  | PRDG | PREDUG                   |
|     |                  |      | INTERPRETED STRATIGRAPHY |
|     |                  |      | SAND / SILT              |
|     |                  |      | SILT / CLAY / TILL       |



Client / Report

RAINSONG LAND DEVELOPMENT  
BARRIE, ONTARIO  
HYDROGEOLOGICAL STUDY  
IN SUPPORT OF DRAFT PLAN

Figure Title

INTERPRETED GEOLOGICAL  
CROSS-SECTION B-B'

Drawn

SK

Checked

SC

Date

November 2019

Scale

1:5,500

Project No

300040547

Figure No

7





- Ranging from 3 to 8 m below existing ground surface.



# Proposed Conditions





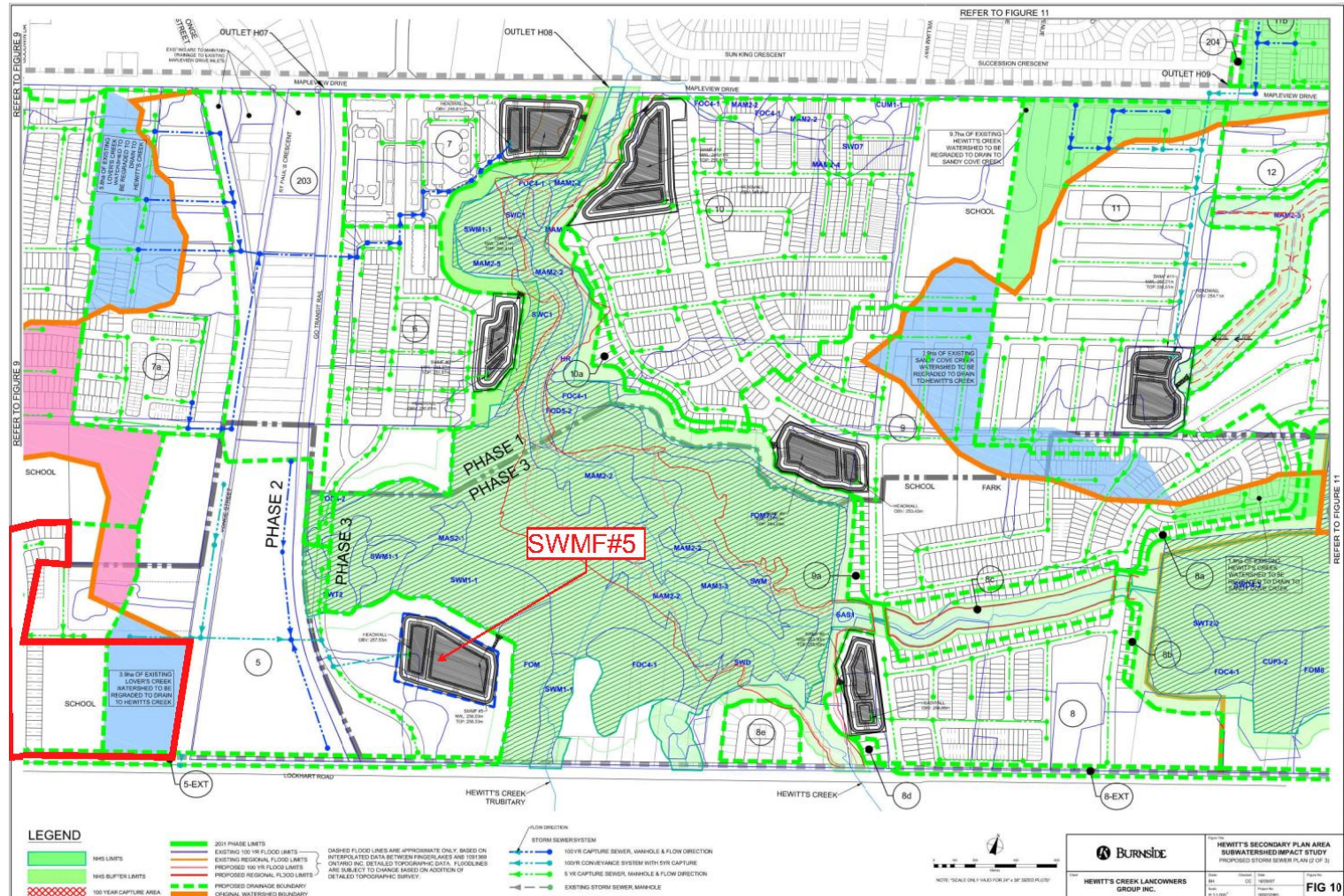
# SWMF#4 & SWMF#5







# Hewitt's Secondary Plan SIS Drainage SWMF#5



## **SWMF#4 and #5**

- Design charrettes have been completed for lands containing SWMF#4 and SWMF#5
- **Therefore this charrette will primarily address the portion of the development proposed to drain to SWMF#3**





# Hewitt's Secondary Plan Area Criteria – Catchment 3



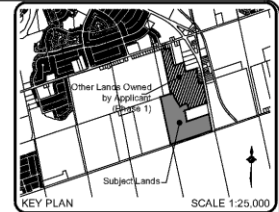
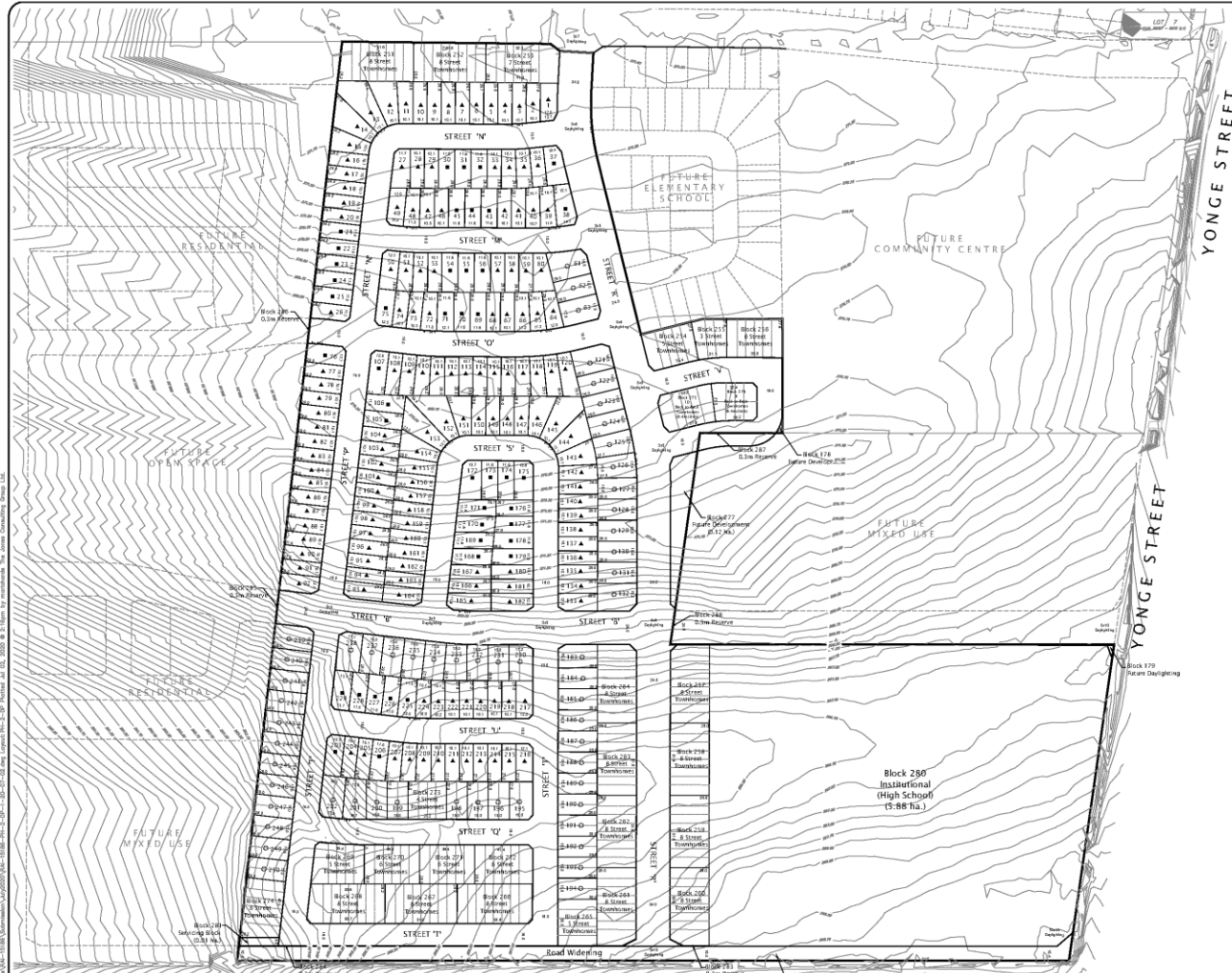
## **Per Subwatershed Impact Study, the Criteria for the Charrette lands are:**

- Quantity Control
  - Control to the allowable release rates outlined in the SIS for 2 through 100 year storms
  
- Quality Control
  - “Enhanced” TSS protection
  - Phosphorus – Greater of:
    - Match Existing Loading Rates
    - 80% Reduction of Proposed Loading Rates
    - Goal is “zero” export
  
- LID Considerations
  - 25 mm of filtration
  - Best efforts infiltration









**Proposed Draft Plan of Subdivision**  
Part of the South Half of Lot 15, Concession 11  
Former Township of Innisfil,  
Now in the City of Barrie, 2020

**OWNER'S CERTIFICATE**  
I, THE UNDERSIGNED, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE THE JONES CONSULTING GROUP LTD., TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND TO SUBMIT SAME TO THE CITY OF BARRIE FOR APPROVAL.

DATE: \_\_\_\_\_ RAINSONG DEVELOPMENT INC.  
I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: \_\_\_\_\_ RILEY MAC, O.L.S.  
ONTARIO LAND SURVEYORS

**ADDITIONAL INFORMATION REQUIRED UNDER SECTION 27(1) OF THE PLANNING ACT**  
1. SHOWN ON DRAFT PLAN 1. SHOWN ON DRAFT PLAN  
2. SHOWN ON DRAFT PLAN 2. SHOWN ON DRAFT PLAN  
3. SHOWN ON DRAFT PLAN 3. SHOWN ON DRAFT PLAN  
4. SHOWN ON DRAFT PLAN 4. SHOWN ON DRAFT PLAN  
5. SHOWN ON DRAFT PLAN 5. SHOWN ON DRAFT PLAN

| STATISTICS         | Area (ha.) | Units     |
|--------------------|------------|-----------|
| 33 Single (1.1 ha) | 1.1        | 43 units  |
| 33 Single (1.1 ha) | 1.1        | 151 units |
| 33 Single (1.1 ha) | 1.1        | 112 units |
| 33 Single (1.1 ha) | 1.1        | 305 units |
| 33 Single (1.1 ha) | 1.1        | 163 units |
| 33 Single (1.1 ha) | 1.1        | 18 units  |
| 33 Single (1.1 ha) | 1.1        | 5.88 ha   |
| 33 Single (1.1 ha) | 1.1        | 0.01 ha   |
| 33 Single (1.1 ha) | 1.1        | 0.03 ha   |
| 33 Single (1.1 ha) | 1.1        | 0.04 ha   |
| 33 Single (1.1 ha) | 1.1        | 24.47 ha  |
| 33 Single (1.1 ha) | 1.1        | 487 units |

SCALE 1:1250 (A1)  
RAINSONG DEVELOPMENT INC.  
PHASE 2 CITY OF BARRIE  
PROPOSED DRAFT PLAN OF SUBDIVISION

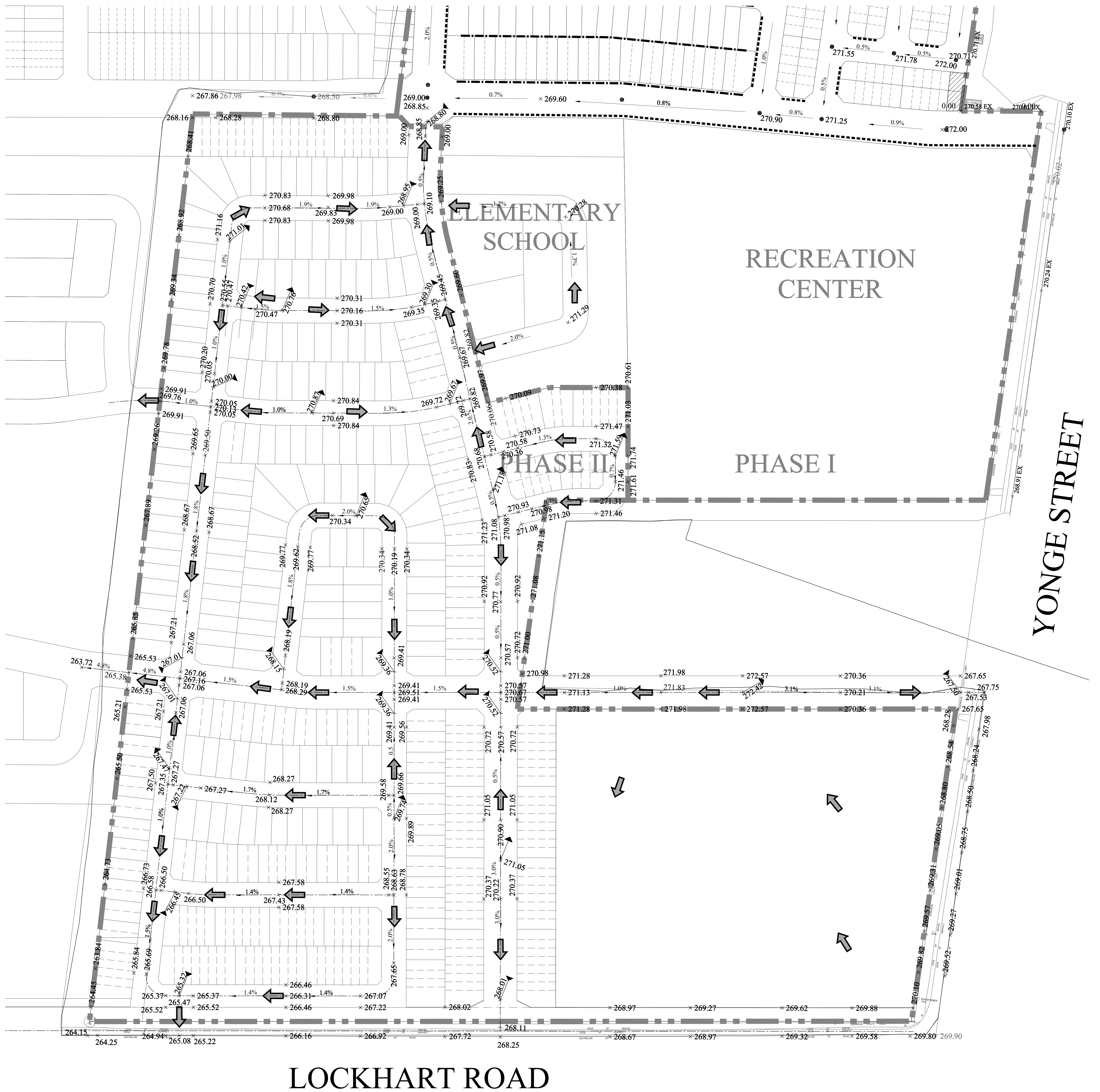
Date issued: JULY 2, 2020  
Checked By: RD  
Project No.: RA-15188  
Drawn By: m.c.  
Drawing Name: RA-15188-Ph-2-SP-1-20-07-02.dwg

**JONES CONSULTING GROUP LTD.**  
PLANNING & SURVEYING  
1000 SHEPPARD AVENUE EAST, SUITE 100  
SCARBOROUGH, ONTARIO M1S 1B7  
TEL: (416) 291-1111 FAX: (416) 291-1112

**RAINSONG DEVELOPMENT INC.**  
PHASE 2  
CITY OF BARRIE

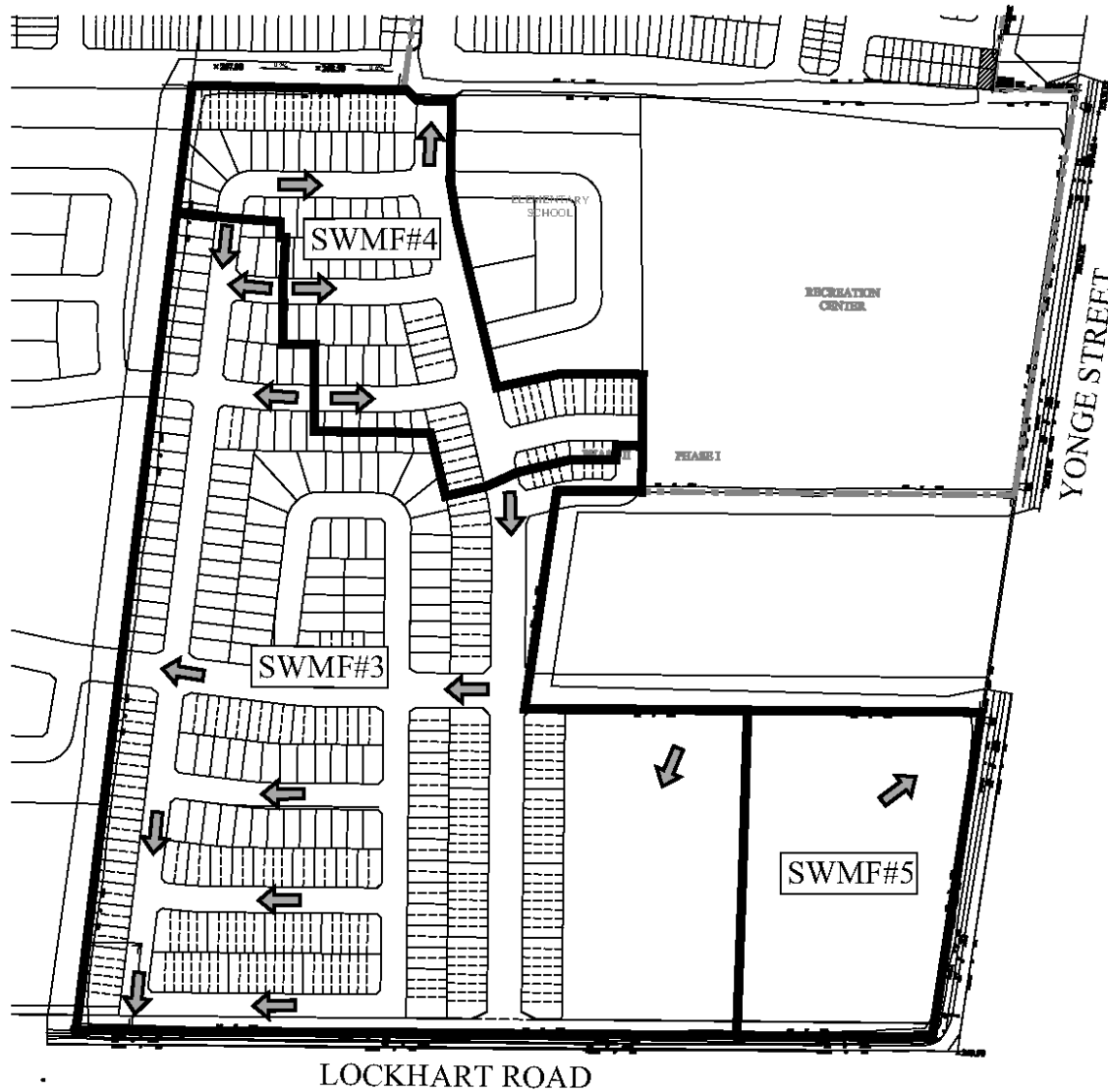
LOCKHART ROAD







# Preliminary Proposed Drainage





# Watershed Divide

- ➔ Goal is to maintain existing watershed drainage areas to the extent feasible.
- ➔ 11.45 ha redirected to Hewitt's Creek in proposed condition
- ➔ 13.40 ha redirected to Lover's Creek in proposed conditions
- ➔ 1.95 ha net redirected to Lover's Creek
- ➔ Accounts for a 0.75% increase in area to the Lover's Creek Watershed (257.6 ha)
- ➔ Less than 0.5 ha increase in watershed diversion from what was contemplated in SIS



LOCKHART INVESTMENTS LTD.

13.40ha

SOBEY'S

4.76ha

1.28ha

1.85ha

3.56ha

LOCKHART ROAD

YONGE STREET

ELEMENTARY SCHOOL

RECREATION CENTER

PHASE I

PHASE II

STREET V

STREET W

STREET X

STREET Y

STREET Z

STREET AA

STREET A

STREET K

STREET CC

STREET BB

STREET DD

STREET EE



30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335

**RUNOFF TO HEWITT'S CREEK IN PROPOSED CONDITION - LOVER'S CREEK IN EXISTING CONDITIONS - 11.45ha**

**RUNOFF TO LOVER'S CREEK IN PROPOSED CONDITION - HEWITT'S CREEK IN EXISTING CONDITIONS - 13.40ha**

|                     |                    |
|---------------------|--------------------|
| DESIGNED BY: X.X.X. | CHECKED BY: X.X.X. |
| SCALE: 1:2000       | DATE: JULY 2020    |

|             |            |
|-------------|------------|
| PROJECT No: | FIGURE No: |
| 1900        | 2.2        |



# Proposed Groundwater Conditions

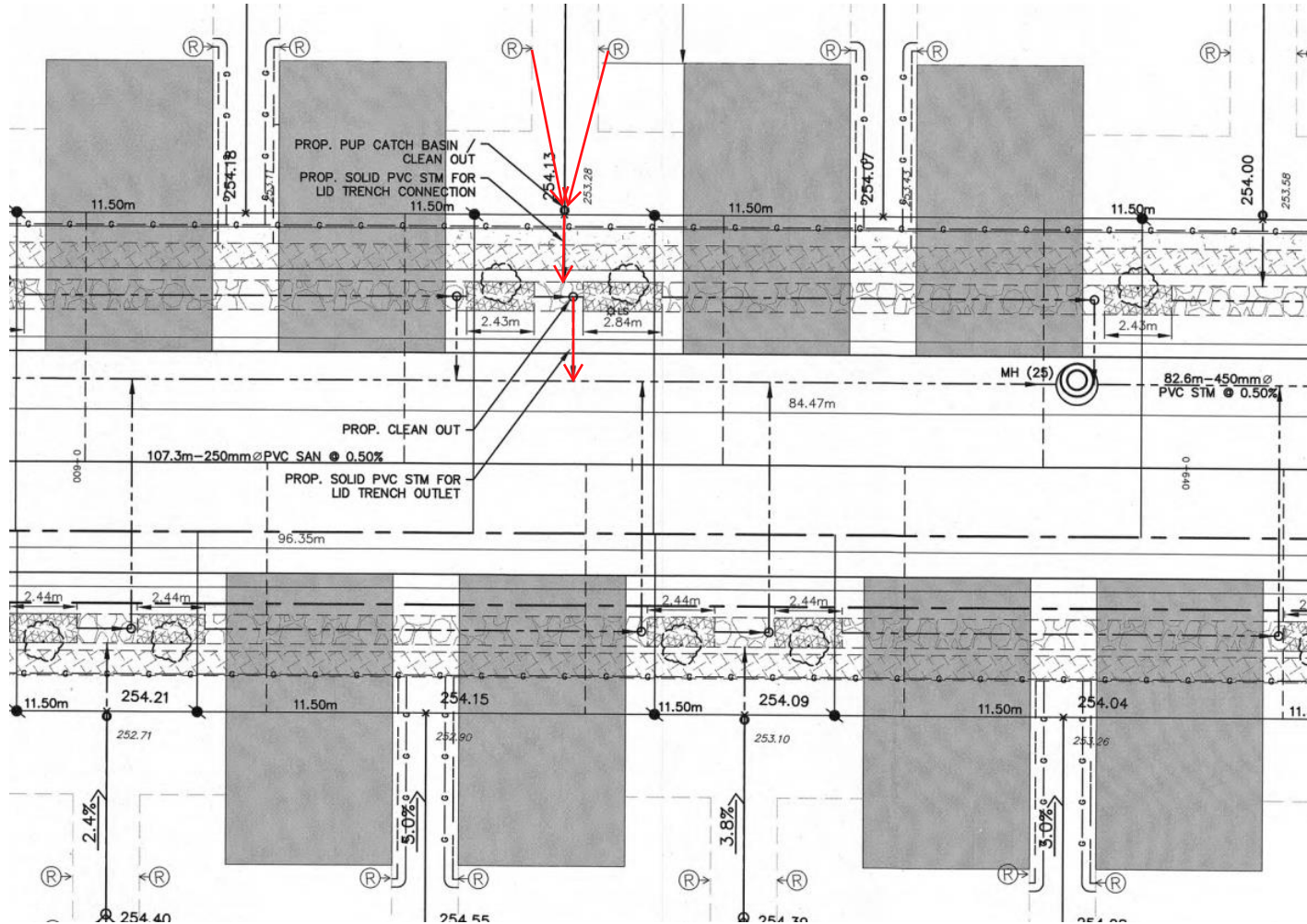


# Potential LIDs

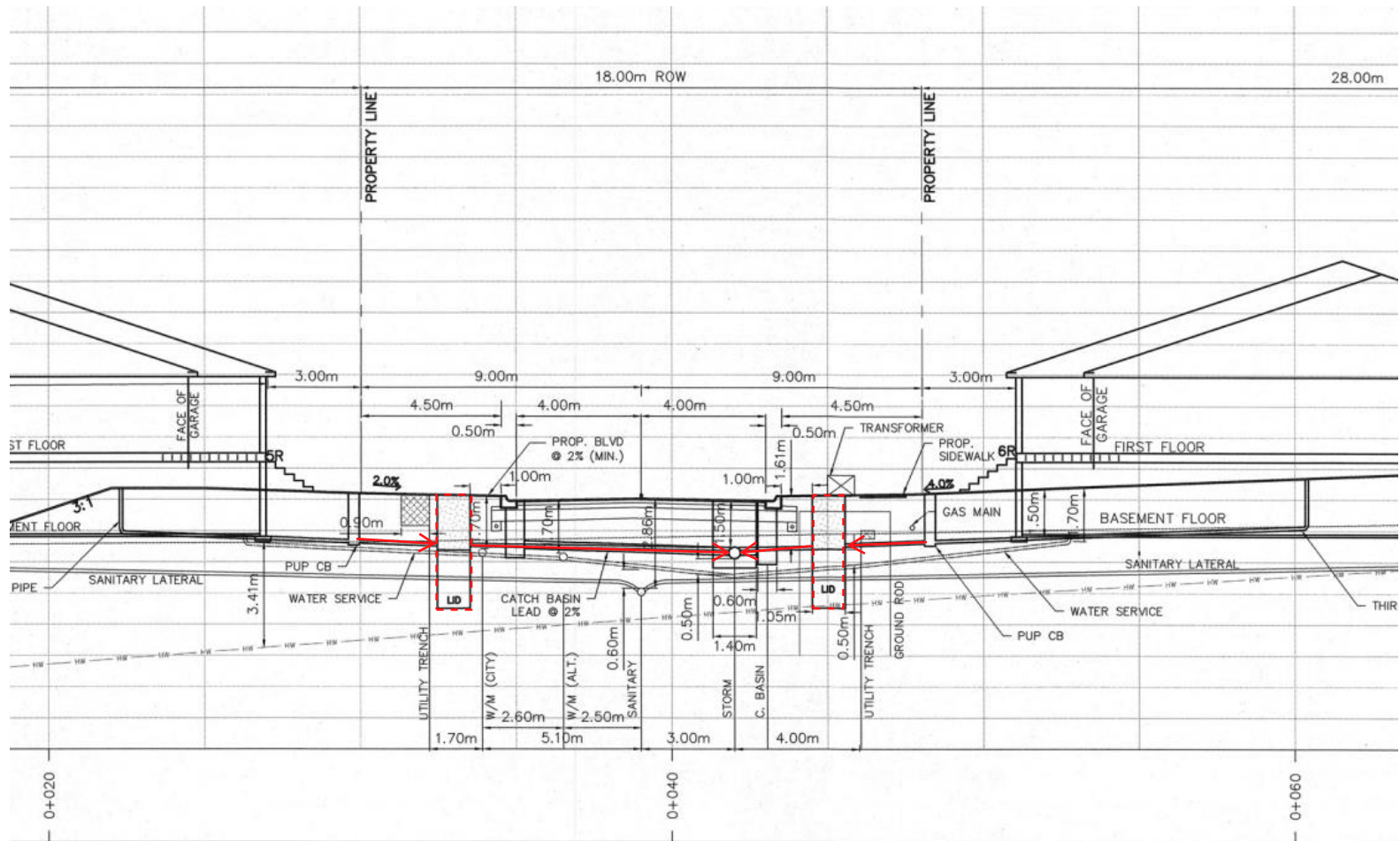




# Right of Way Infiltration Trench

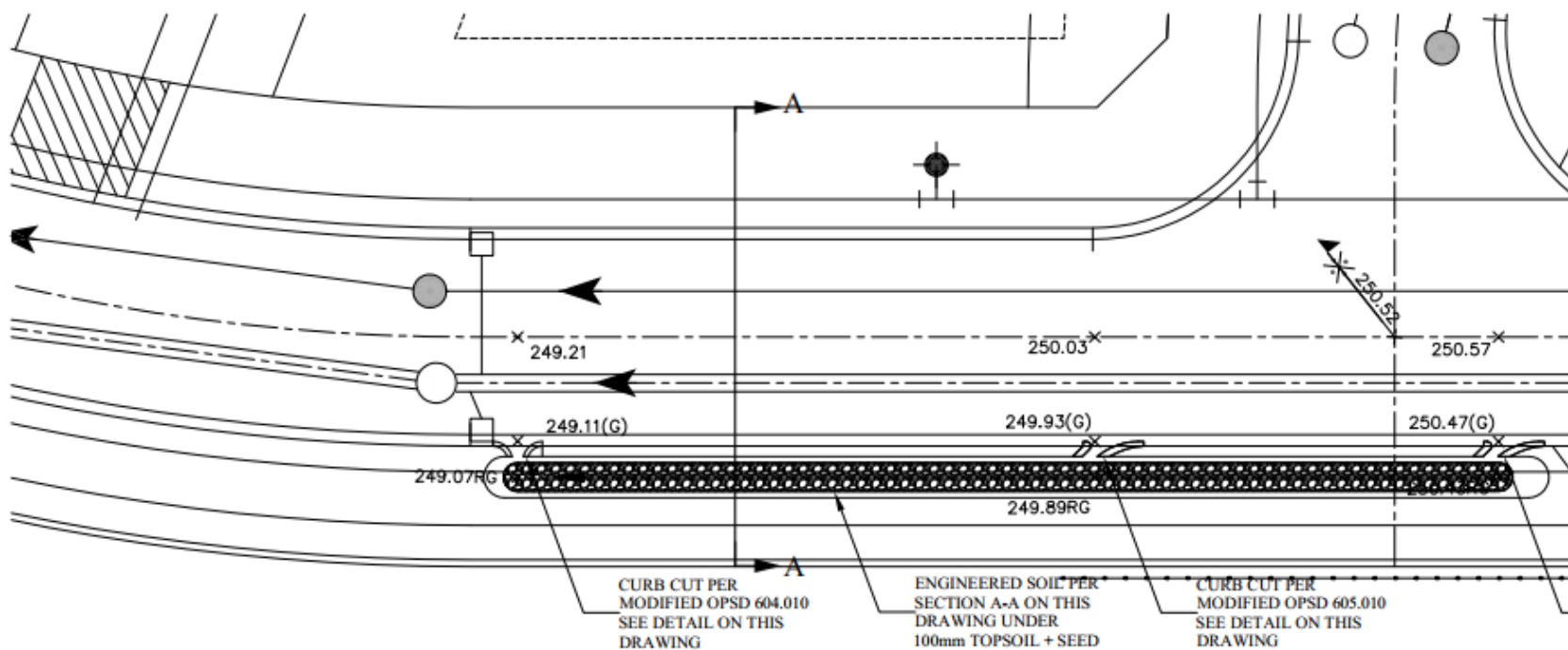


# Right of Way Infiltration Trench





# Rain Gardens

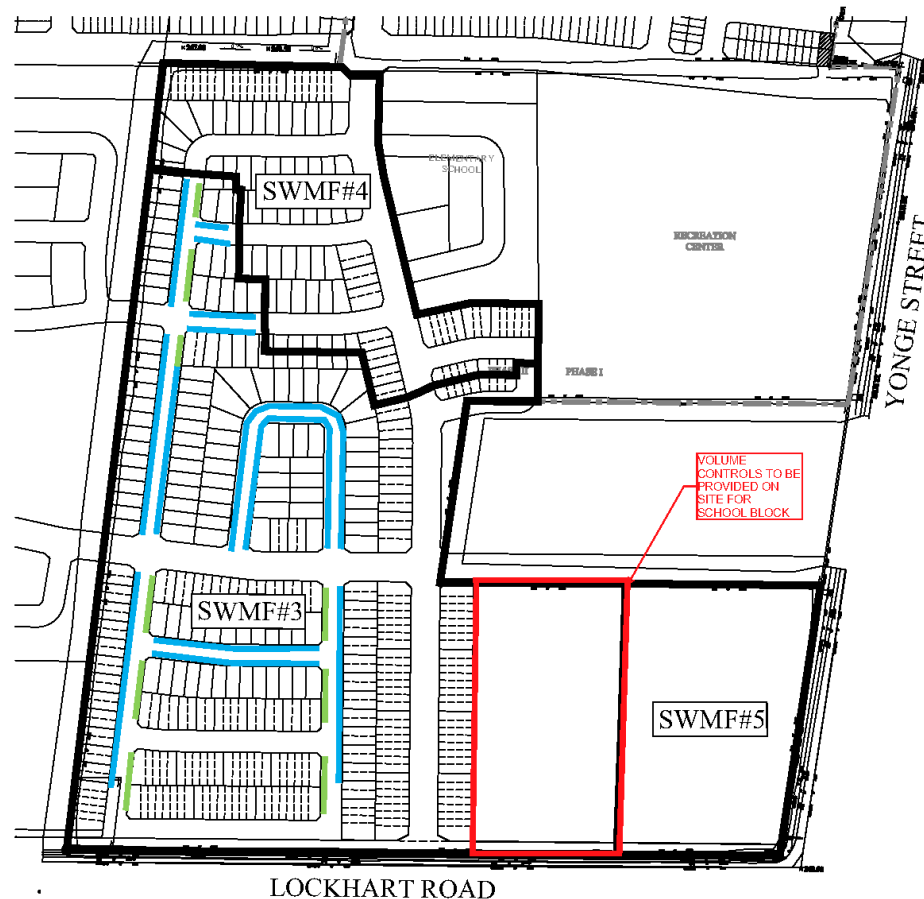


**RAIN GARDEN - PLAN VIEW**

SCALE: 1:250



# Potential LIDs



LOCKHART ROAD

- PROPOSED INFILTRATION TRENCH
- PROPOSED RAIN GARDEN



# Next Steps

- Meeting Minutes will be circulated to all parties outlining agreed upon solutions.
- Final minutes to be incorporated into FSR to ensure agreed upon solutions are documented going forward.
- Additional information requested/required to be circulated ASAP for review alongside minutes.
- Accepted Stormwater Management Solution to be incorporated into Functional Servicing Report.
- Provide input into downstream SWM infrastructure as information becomes available.



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## **Appendix C      Stormwater Management Calculations**

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## Proposed Conditions Percent Impervious Calculations

| Catchment Area (ha)              |      |      | Lovers Creek Tributary | Hewitts Creek Tributary |       |
|----------------------------------|------|------|------------------------|-------------------------|-------|
|                                  |      |      | 21.14                  | 3.32                    |       |
| Land Use Areas                   | Timp | Ximp | Land Use Areas         |                         | Total |
| School Block                     | 79%  | 79%  | 2.68                   | 3.20                    | 5.88  |
| Future Development & Daylighting | 90%  | 90%  | 0.01                   | 0.12                    | 0.13  |
| Servicing Block                  | 100% | 100% | 0.01                   |                         | 0.01  |
| Road Widening & Reserves         | 90%  | 90%  | 0.63                   |                         | 0.63  |
| Singles 18m ROW                  | 68%  | 40%  | 9.18                   |                         | 9.18  |
| Semis 18m ROW                    | 79%  | 56%  | 2.64                   |                         | 2.64  |
| Semis 24m ROW                    | 69%  | 59%  | 1.02                   |                         | 1.02  |
| Street Towns 18m ROW             | 79%  | 56%  | 0.70                   |                         | 0.70  |
| Street Towns 24m ROW             | 69%  | 59%  | 1.81                   |                         | 1.81  |
| Back to Back Towns 18m ROW       | 91%  | 76%  | 2.46                   |                         | 2.46  |
| Total Land Use =                 |      |      | 21.14                  | 3.32                    | 24.46 |
| Timp =                           |      |      | 74%                    | 79%                     | 75%   |
| Ximp =                           |      |      | 56%                    | 79%                     | 59%   |

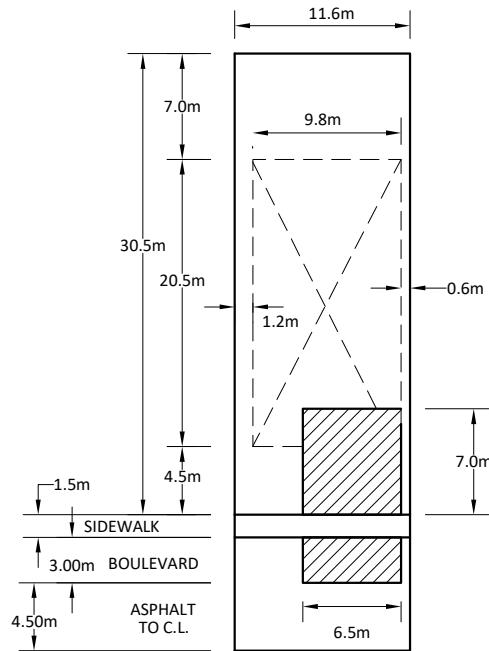
### Percent Impervious (Timp) Calculations per Figures C-1 - C-3

| Land Use      | Lot Type      |               |       |           |           |
|---------------|---------------|---------------|-------|-----------|-----------|
| Single Houses | 10.1m x 30.5m | 11.6m x 30.5m | -     | Max. Timp | Max. Ximp |
| 18m ROW       | 68%           | 70%           | -     | 70%       | 43%       |
| Semis & Towns | Street        | Back to Back  | Semis | Max. Timp | Max. Ximp |
| 18m ROW       | 79%           | 91%           | 79%   | 91%       | 77%       |
| 24m ROW       | 69%           | --            | 69%   |           |           |

\*Ximp calculations based on total impervious areas directly connected

*Note: Since the calculated single detached house percent impervious was calculated to be greater than the City of Barrie Design Criteria ( **45%** ), the maximum calculated percent impervious value of **71%** was used. Likewise for the semis and townhouses, the maximum calculated imperviousness is greater than the City of Barrie criteria, and therefore the calculated value of **79%** was used.*

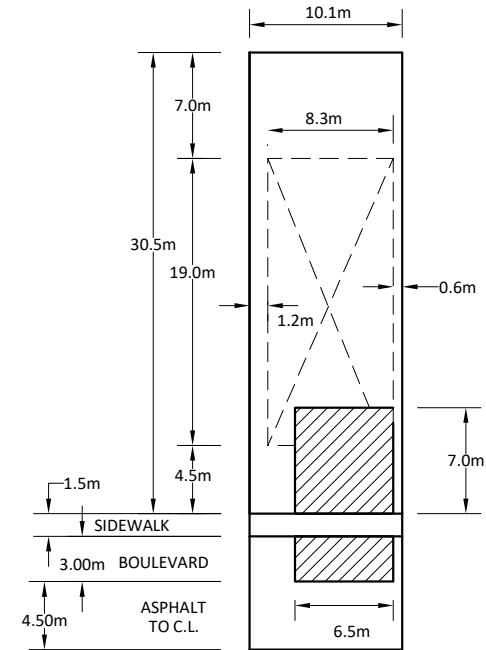
TYPICAL 11.6m x 30.5m SINGLE DETACHED  
DWELLING WITH 18.0m ROW



CALCULATED PERCENT IMPERVIOUS = 70%

NOTE: SIDEWALK IS ONLY ON ONE SIDE OF ROW

TYPICAL 10.1m x 30.5m  
SINGLE DETACHED DWELLING WITH 18.0m ROW



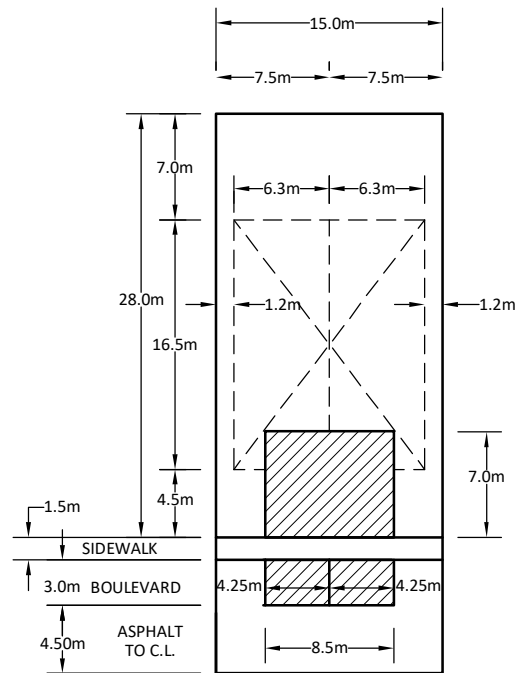
CALCULATED PERCENT IMPERVIOUS = 68%

NOTE: SIDEWALK IS ONLY ON ONE SIDE OF ROW

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

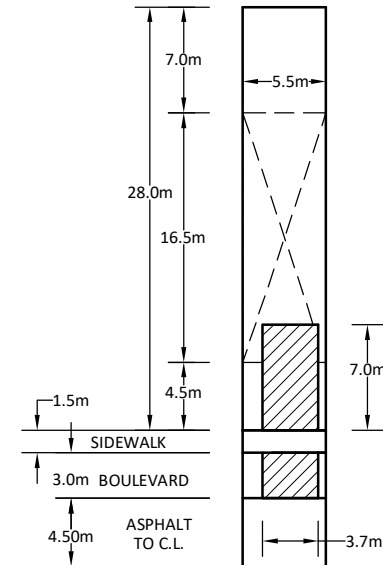
| RAINSONG DEVELOPMENT -<br>BARRIE PHASE 2                                                                |                     | TYPICAL LAYOUT FOR SINGLE<br>DETACHED DWELLING - 18m R.O.W. |             |
|---------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------|-------------|
|                      | DESIGNED BY: M.G.V. | CHECKED BY: J.M.P.                                          | PROJECT No: |
|                                                                                                         | SCALE: 1:500        | DATE: FEBRUARY 2022                                         | FIGURE No:  |
| 30 CENTURIAN DRIVE, SUITE 100<br>MARKHAM, ONTARIO L3R 8B8<br>TEL: (905) 475-1900<br>FAX: (905) 475-8335 |                     | 1900T                                                       | C-1         |

TYPICAL 15m x 28m  
SEMI-DETACHED DWELLING WITH 18.0m ROW



CALCULATED PERCENT IMPERVIOUS = 68%  
NOTE: SIDEWALK IS ONLY ON ONE SIDE OF THE ROW

TYPICAL 5.5m x 28m  
SINGLE TOWNHOUSE WITH 18.0m ROW



CALCULATED PERCENT IMPERVIOUS = 79%  
NOTE: SIDEWALK IS ONLY ON ONE SIDE OF THE ROW

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

## RAINSONG DEVELOPMENT - BARRIE PHASE 2

TYPICAL LOT LAYOUT FOR SEMI-DETACHED AND  
BACK TO BACK TOWNHOUSE LOTS 18m ROW



30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335

DESIGNED BY: M.G.V.

CHECKED BY: J.M.P.

SCALE: 1:500

DATE: FEBRUARY 2022

PROJECT No:

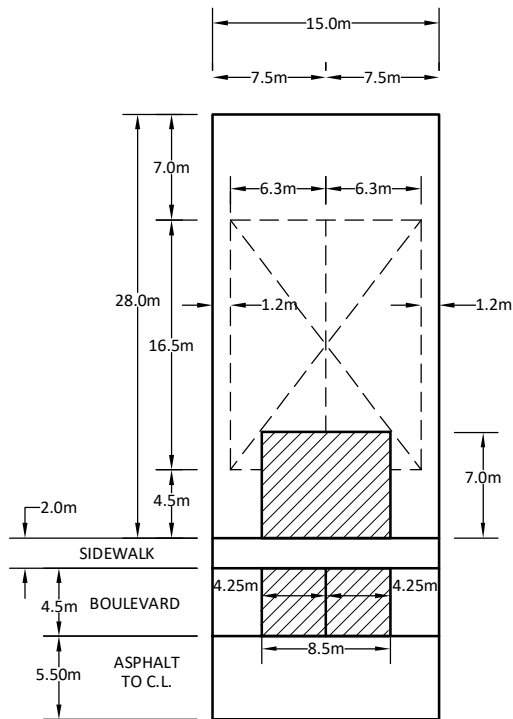
1900T

FIGURE No:

C-2

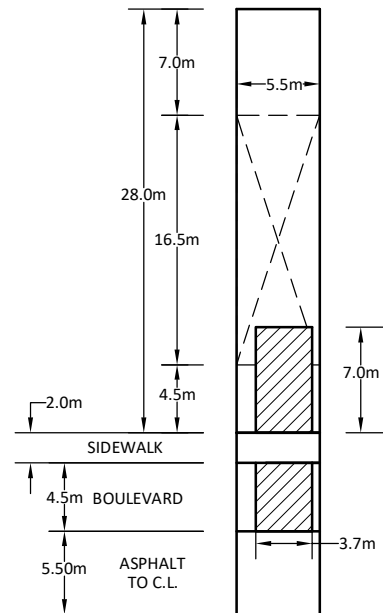


TYPICAL 15m x 28m  
SEMI-DETACHED DWELLING WITH 24.0m ROW



CALCULATED PERCENT IMPERVIOUS = 69%

TYPICAL 5.5m x 28m  
SINGLE TOWNHOUSE WITH 24.0m ROW



NOTE: SIDEWALK IS ONLY ON ONE SIDE OF THE ROW  
CALCULATED PERCENT IMPERVIOUS = 79%

\*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.



30 CENTURIAN DRIVE, SUITE 100  
MARKHAM, ONTARIO L3R 8B8  
TEL: (905) 475-1900  
FAX: (905) 475-8335

## RAINSONG DEVELOPMENT - BARRIE PHASE 2

TYPICAL LOT LAYOUT FOR SEMI-DETACHED AND BACK  
TO BACK TOWNHOUSE LOTS 24m ROW

DESIGNED BY: M.G.V.

CHECKED BY: J.M.P.

PROJECT No:

FIGURE No:

SCALE: 1:500

DATE: FEBRUARY 2022

1900T

C-3

## Post Development Conditions

| Catchment                  | Area (ha)    | Imperviousness (%) | Rainfall Depth (mm) | Retention Volume (m <sup>3</sup> )               |
|----------------------------|--------------|--------------------|---------------------|--------------------------------------------------|
|                            | (1)          | (2)                | (3)                 | (4) = (3) x (2) x (1) x 10 m <sup>3</sup> /ha*mm |
| 201 - w/o School           | 3.10         | 74%                | 25                  | 574                                              |
| 202 - w/o School           | 9.66         | 74%                | 25                  | 1787                                             |
| 203 - w/o School           | 4.67         | 74%                | 25                  | 864                                              |
| 204 + 203 (School Portion) | 6.39         | 79%                | 25                  | 1255                                             |
| 205                        | 0.65         | 74%                | 25                  | 120                                              |
| <b>Total</b>               | <b>24.47</b> | <b>75%</b>         | <b>--</b>           | <b>4600</b>                                      |

Based on 25 mm rainfall depth over impervious areas, capture is required for 4,600 m<sup>3</sup> of runoff within LIDs.

## Preliminary LID Volume Calculation

|                                        | Length (m)                  | Width (m)              | Depth (m)              | Porosity              | Volume (m <sup>3</sup> ) | Equivalent Rainfall Depth Over Impervious Area (mm) |
|----------------------------------------|-----------------------------|------------------------|------------------------|-----------------------|--------------------------|-----------------------------------------------------|
|                                        | ROW Exfiltration Length (m) | Exfiltration Width (m) | Exfiltration Depth (m) | Exfiltration Porosity | Volume (m <sup>3</sup> ) |                                                     |
| Street N                               | 150                         | 1.8                    | 1                      | 0.4                   | 108                      |                                                     |
| Street M                               | 50                          | 1.8                    | 1                      | 0.4                   | 36                       |                                                     |
| Street R                               | 75                          | 1.8                    | 1                      | 0.4                   | 54                       |                                                     |
| 201 ROW Catchbasin Exfiltration Trench | 275                         | 1.8                    | 1.0                    | 0.4                   | <b>198</b>               | <b>9</b>                                            |
|                                        |                             |                        |                        |                       |                          |                                                     |
|                                        | Rain Garden Length (m)      | Rain Garden Width (m)  | Rain Garden Depth (m)  | Rain Garden Porosity  | Volume (m <sup>3</sup> ) |                                                     |
| Street R                               | 200                         | 1.0                    | 1.8                    | 0.4                   | 144                      |                                                     |
| 201 Rain Gardens                       | 200                         | 1.0                    | 1.8                    | 0.4                   | <b>144</b>               | <b>6</b>                                            |
|                                        |                             |                        |                        |                       |                          |                                                     |
| <b>Overall Catchment 201</b>           |                             |                        |                        |                       | <b>342</b>               | <b>15</b>                                           |
|                                        |                             |                        |                        |                       |                          |                                                     |
| Mattamy Lockhart Infiltration Facility | 90                          | 86                     | 1.0                    | 1                     | <b>7740</b>              | <b>80</b>                                           |
|                                        |                             |                        |                        |                       |                          |                                                     |
| <b>Overall Catchment 202</b>           |                             |                        |                        |                       | <b>7740</b>              | <b>80</b>                                           |
|                                        |                             |                        |                        |                       |                          |                                                     |
|                                        | Rain Garden Length (m)      | Rain Garden Width (m)  | Rain Garden Depth (m)  | Rain Garden Porosity  | Volume                   |                                                     |
| Street T                               | 70                          | 1.0                    | 1.5                    | 0.4                   | 42                       |                                                     |
| Street T                               | 130                         | 1.0                    | 1.5                    | 0.4                   | 78                       |                                                     |
| Street T                               | 110                         | 1.0                    | 1.5                    | 0.4                   | 66                       |                                                     |
| Rain Gardens                           | 310                         | 1.0                    | 1.5                    | 0.4                   | <b>186</b>               | <b>5</b>                                            |
|                                        |                             |                        |                        |                       |                          |                                                     |
| <b>Overall Catchment 203 + 205</b>     |                             |                        |                        |                       | <b>186</b>               | <b>5</b>                                            |
| <b>TOTAL</b>                           | <b>-</b>                    | <b>-</b>               | <b>-</b>               | <b>-</b>              | <b>8268</b>              | <b>45</b>                                           |

## LSRCA RAIN GARDENS

|                                                            |         |                                                                 |                                                 |
|------------------------------------------------------------|---------|-----------------------------------------------------------------|-------------------------------------------------|
| Grainsize Analyses and Single Well Response Test Resultant | 234.20  |                                                                 |                                                 |
| Infiltration Rate =                                        | mm/hr   | *Per R.J. Burnside's Hydrogeological Assessment (December 2021) |                                                 |
| TRCA Infiltration Rate Safety Factor =                     | 4.5     |                                                                 |                                                 |
| Resulting Infiltration Rate (i) =                          | 52.0443 |                                                                 |                                                 |
| Void Space Ratio ( $V_r$ ) =                               | 0.4     |                                                                 |                                                 |
| Time to Drain ( $t_d$ ) =                                  | 24      | hr                                                              |                                                 |
| Water Quality Volume Required (WQV) =                      | 144     | m <sup>3</sup>                                                  | *Per Preliminary Rain Garden Sizing Calculation |
| Filter Bed Depth ( $d_b$ ) =                               | 1.8     | m                                                               | *Proposed Rain Garden system depth              |

$$d_{rmax} = i * \frac{t_d}{V_r} \quad \text{Equation (1)}$$

|                                                    |       |   |
|----------------------------------------------------|-------|---|
| Max. depth stone below underdrain ( $d_{rmax}$ ) = | 3.123 | m |
| Proposed depth of stone below underdrain =         | 1.8   | m |

Therefore, since the proposed rain garden has a depth of stone below the underdrain of 1.8 m, which is less than the maximum, the proposed rain garden is in accordance with the TRCA LID criteria.

$$A_f = \frac{WQV}{d_b V_r} \quad \text{Equation (2)}$$

|                                       |       |                |
|---------------------------------------|-------|----------------|
| Minimum footprint area ( $A_f$ ) =    | 200.0 | m <sup>2</sup> |
| Proposed rain garden footprint area = | 200.0 | m <sup>2</sup> |

Therefore, since the proposed rain garden footprint is greater than the minimum, the proposed rain garden is in accordance with the TRCA LID criteria.

|                                       |        |                |
|---------------------------------------|--------|----------------|
| Proposed rain garden footprint area = | 200.0  | m <sup>2</sup> |
| Proposed impervious drainage area =   | 2657.0 | m <sup>2</sup> |

|                                                               |      |   |        |
|---------------------------------------------------------------|------|---|--------|
| Ratio of impervious drainage area to footprint surface area = | 0.08 | = | 13.3:1 |
|---------------------------------------------------------------|------|---|--------|

We note that the ratio of impervious drainage area to LID surface area for the proposed rain garden falls within the 5:1 to 15:1 TRCA LID criteria. Note this LID operates in tandem with the proposed CB Exfiltration for the overall catchment. The rain garden footprint has been maximized based on the updated site plan.



# WATER BALANCE EXFILTRATION TRENCH DESIGN

Rainsong Development Phase 2

Job Number: 1900T

Date: February 2022

Designer Initials: M.G.V.

## LSRCA ROW CATCHBASIN EXFILTRATION TRENCHES

|                                                            |         |                                                                 |                                                         |
|------------------------------------------------------------|---------|-----------------------------------------------------------------|---------------------------------------------------------|
| Grainsize Analyses and Single Well Response Test Resultant | 234.20  |                                                                 |                                                         |
| Infiltration Rate =                                        | mm/hr   | *Per R.J. Burnside's Hydrogeological Assessment (December 2021) |                                                         |
| TRCA Infiltration Rate Safety Factor =                     | 4.5     |                                                                 |                                                         |
| Resulting Infiltration Rate (i) =                          | 52.0443 |                                                                 |                                                         |
| Void Space Ratio ( $V_r$ ) =                               | 0.4     |                                                                 |                                                         |
| Time to Drain ( $t_d$ ) =                                  | 24      | hr                                                              |                                                         |
| Water Quality Volume Required (WQV) =                      | 198     | m <sup>3</sup>                                                  | *Per Preliminary exfiltration trench Sizing Calculation |
| Filter Bed Depth ( $d_b$ ) =                               | 1.8     | m                                                               | *Proposed exfiltration system depth                     |

$$d_{rmax} = i * \frac{t_d}{V_r} \quad \text{Equation (1)}$$

|                                                    |       |   |
|----------------------------------------------------|-------|---|
| Max. depth stone below underdrain ( $d_{rmax}$ ) = | 3.123 | m |
| Proposed depth of stone below underdrain =         | 1.0   | m |

Therefore, since the proposed exfiltration trench has a depth of stone below the underdrain of 1.0 m, which is less than the maximum, the proposed rain garden is in accordance with the TRCA LID criteria.

$$A_f = \frac{WQV}{d_b V_r} \quad \text{Equation (2)}$$

|                                               |       |                |
|-----------------------------------------------|-------|----------------|
| Minimum footprint area ( $A_f$ ) =            | 275.0 | m <sup>2</sup> |
| Proposed exfiltration trench footprint area = | 495.0 | m <sup>2</sup> |

Therefore, since the proposed rain garden footprint is greater than the minimum, the proposed rain garden is in accordance with the TRCA LID criteria.

|                                               |         |                |
|-----------------------------------------------|---------|----------------|
| Proposed exfiltration trench footprint area = | 495.0   | m <sup>2</sup> |
| Proposed impervious drainage area =           | 13019.5 | m <sup>2</sup> |

|                                                               |      |   |        |
|---------------------------------------------------------------|------|---|--------|
| Ratio of impervious drainage area to footprint surface area = | 0.04 | = | 26.3:1 |
|---------------------------------------------------------------|------|---|--------|

We note that the ratio of impervious drainage area to LID surface area for the proposed exfiltration trenches does not fall within the 5:1 to 15:1 TRCA LID criteria. Note this LID operates in tandem with the proposed rain gardens for the overall catchment. The exfiltration trench footprint has been maximized based on the updated site plan.

| Catchment A                       | Return Period  |
|-----------------------------------|----------------|
|                                   | 5 Year         |
| Area (ha) <sup>1</sup> =          | 1.85           |
| Runoff Coeff. =                   | 0.69           |
| T <sub>c</sub> (min)=             | 11.90          |
| <b>a =</b>                        | <b>853.608</b> |
| <b>b =</b>                        | <b>4.699</b>   |
| <b>c =</b>                        | <b>0.766</b>   |
| Intensity (mm/hr) =               | 99.24          |
| Return Period Factor =            | 1.00           |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>0.352</b>   |

| Catchment A                       | Return Period   |
|-----------------------------------|-----------------|
|                                   | 100 Year        |
| Area (ha) <sup>1</sup> =          | 1.85            |
| Runoff Coeff. =                   | 0.69            |
| T <sub>c</sub> (min)=             | 11.90           |
| <b>a =</b>                        | <b>1426.408</b> |
| <b>b =</b>                        | <b>5.273</b>    |
| <b>c =</b>                        | <b>0.759</b>    |
| Intensity (mm/hr) =               | 164.81          |
| Return Period Factor =            | 1.25            |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>0.731</b>    |

**5 Year Flow**

$$Q_{5\text{yr}} \text{ (m}^3\text{/s)} = 0.352$$

**100 Year Flow**

$$Q_{100\text{yr}} \text{ (m}^3\text{/s)} = 0.731$$

**Required 100 Year Overland Flow Conveyance**

$$Q_{100-5\text{yr}} \text{ (m}^3\text{/s)} = 0.379$$

| Catchment B                       | Return Period  |
|-----------------------------------|----------------|
|                                   | 5 Year         |
| Area (ha) <sup>1</sup> =          | 2.60           |
| Runoff Coeff. =                   | 0.75           |
| T <sub>c</sub> (min)=             | 13.32          |
| <b>a =</b>                        | <b>853.608</b> |
| <b>b =</b>                        | <b>4.699</b>   |
| <b>c =</b>                        | <b>0.766</b>   |
| Intensity (mm/hr) =               | 93.19          |
| Return Period Factor =            | 1.00           |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>0.505</b>   |

| Catchment B                       | Return Period   |
|-----------------------------------|-----------------|
|                                   | 100 Year        |
| Area (ha) <sup>1</sup> =          | 2.60            |
| Runoff Coeff. =                   | 0.75            |
| T <sub>c</sub> (min)=             | 13.32           |
| <b>a =</b>                        | <b>1426.408</b> |
| <b>b =</b>                        | <b>5.273</b>    |
| <b>c =</b>                        | <b>0.759</b>    |
| Intensity (mm/hr) =               | 155.17          |
| Return Period Factor =            | 1.25            |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>1.051</b>    |

**5 Year Flow**

$$Q_{5yr} (m^3/s) = 0.505$$

**100 Year Flow**

$$Q_{100yr} (m^3/s) = 1.051$$

**Required 100 Year Overland Flow Conveyance**

$$Q_{100-5yr} (m^3/s) = 0.546$$



| Catchment C                       | Return Period  |
|-----------------------------------|----------------|
|                                   | 5 Year         |
| Area (ha) <sup>1</sup> =          | 7.30           |
| Runoff Coeff. =                   | 0.75           |
| T <sub>c</sub> (min)=             | 17.12          |
| <b>a =</b>                        | <b>853.608</b> |
| <b>b =</b>                        | <b>4.699</b>   |
| <b>c =</b>                        | <b>0.766</b>   |
| Intensity (mm/hr) =               | 80.48          |
| Return Period Factor =            | 1.00           |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>1.224</b>   |

| Catchment C                       | Return Period   |
|-----------------------------------|-----------------|
|                                   | 100 Year        |
| Area (ha) <sup>1</sup> =          | 7.30            |
| Runoff Coeff. =                   | 0.75            |
| T <sub>c</sub> (min)=             | 17.12           |
| <b>a =</b>                        | <b>1426.408</b> |
| <b>b =</b>                        | <b>5.273</b>    |
| <b>c =</b>                        | <b>0.759</b>    |
| Intensity (mm/hr) =               | 134.74          |
| Return Period Factor =            | 1.25            |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>2.562</b>    |

**5 Year Flow**

$$Q_{5yr} (m^3/s) = 1.224$$

**100 Year Flow**

$$Q_{100yr} (m^3/s) = 2.562$$

**Required 100 Year Overland Flow Conveyance**

$$Q_{100-5yr} (m^3/s) = 1.338$$

| Catchment D                       | Return Period  |
|-----------------------------------|----------------|
|                                   | 5 Year         |
| Area (ha) <sup>1</sup> =          | 4.00           |
| Runoff Coeff. =                   | 0.75           |
| T <sub>c</sub> (min)=             | 17.11          |
| <b>a =</b>                        | <b>853.608</b> |
| <b>b =</b>                        | <b>4.699</b>   |
| <b>c =</b>                        | <b>0.766</b>   |
| Intensity (mm/hr) =               | 80.51          |
| Return Period Factor =            | 1.00           |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>0.671</b>   |

| Catchment D                       | Return Period   |
|-----------------------------------|-----------------|
|                                   | 100 Year        |
| Area (ha) <sup>1</sup> =          | 4.00            |
| Runoff Coeff. =                   | 0.75            |
| T <sub>c</sub> (min)=             | 17.11           |
| <b>a =</b>                        | <b>1426.408</b> |
| <b>b =</b>                        | <b>5.273</b>    |
| <b>c =</b>                        | <b>0.759</b>    |
| Intensity (mm/hr) =               | 134.79          |
| Return Period Factor =            | 1.25            |
| <b>Runoff (m<sup>3</sup>/s) =</b> | <b>1.404</b>    |

**5 Year Flow**

$$Q_{5yr} \text{ (m}^3\text{/s)} = 0.671$$

**100 Year Flow**

$$Q_{100yr} \text{ (m}^3\text{/s)} = 1.404$$

**Required 100 Year Overland Flow Conveyance**

$$Q_{100-5yr} \text{ (m}^3\text{/s)} = 0.733$$

## Project Description

Solve For Normal Depth

### Input Data

|           |                        |
|-----------|------------------------|
| Discharge | 0.38 m <sup>3</sup> /s |
|-----------|------------------------|

## Section Definitions

| Station (m) | Elevation (m) |
|-------------|---------------|
| 0+000       | 0.00          |
| 0+000.3     | -0.01         |
| 0+001.5     | -0.03         |
| 0+004.5     | -0.09         |
| 0+004.65    | -0.09         |
| 0+004.7     | -0.24         |
| 0+009       | -0.15         |
| 0+013.3     | -0.24         |
| 0+013.35    | -0.09         |
| 0+013.5     | -0.09         |
| 0+016.2     | -0.04         |
| 0+017.7     | -0.01         |
| 0+018       | 0.00          |

### Roughness Segment Definitions

| Start Station     | Ending Station    | Roughness Coefficient |
|-------------------|-------------------|-----------------------|
| (0+000, 0.00)     | (0+000.3, -0.01)  | 0.025                 |
| (0+000.3, -0.01)  | (0+001.5, -0.03)  | 0.013                 |
| (0+001.5, -0.03)  | (0+004.5, -0.09)  | 0.025                 |
| (0+004.5, -0.09)  | (0+004.65, -0.09) | 0.013                 |
| (0+004.65, -0.09) | (0+004.7, -0.24)  | 0.013                 |
| (0+004.7, -0.24)  | (0+009, -0.15)    | 0.013                 |
| (0+009, -0.15)    | (0+013.3, -0.24)  | 0.013                 |
| (0+013.3, -0.24)  | (0+013.35, -0.09) | 0.013                 |



## Worksheet for XSEC A-A - 18m ROW with 2% boulevard

### Input Data

| Start Station     | Ending Station   | Roughness Coefficient |
|-------------------|------------------|-----------------------|
| (0+013.35, -0.09) | (0+013.5, -0.09) | 0.013                 |
| (0+013.5, -0.09)  | (0+016.2, -0.04) | 0.025                 |
| (0+016.2, -0.04)  | (0+017.7, -0.01) | 0.013                 |
| (0+017.7, -0.01)  | (0+018, 0.00)    | 0.025                 |

### Results

|                  |                     |                |
|------------------|---------------------|----------------|
| Normal Depth     | 0.09                | m              |
| Elevation Range  | -0.2400 to 0.0000 m |                |
| Flow Area        | 0.40                | m <sup>2</sup> |
| Wetted Perimeter | 8.7893              | m              |
| Top Width        | 8.6593              | m              |
| Normal Depth     | 0.09                | m              |
| Critical Depth   | 0.10                | m              |
| Critical Slope   | 0.00438             | m/m            |
| Velocity         | 0.95                | m/s            |
| Velocity Head    | 0.05                | m              |
| Specific Energy  | 0.14                | m              |
| Froude Number    | 1.42                |                |
| Flow Type        | Supercritical       |                |

### GVF Input Data

|                  |        |   |
|------------------|--------|---|
| Downstream Depth | 0.00   | m |
| Length           | 0.0000 | m |
| Number Of Steps  | 0      |   |

### GVF Output Data

|                     |          |     |
|---------------------|----------|-----|
| Upstream Depth      | 0.00     | m   |
| Profile Description |          |     |
| Profile Headloss    | 0.00     | m   |
| Downstream Velocity | Infinity | m/s |
| Upstream Velocity   | Infinity | m/s |
| Normal Depth        | 0.09     | m   |
| Critical Depth      | 0.10     | m   |
| Channel Slope       | 0.00950  | m/m |
| Critical Slope      | 0.00438  | m/m |

## Cross Section for XSEC A-A - 18m ROW with 2% boulevard

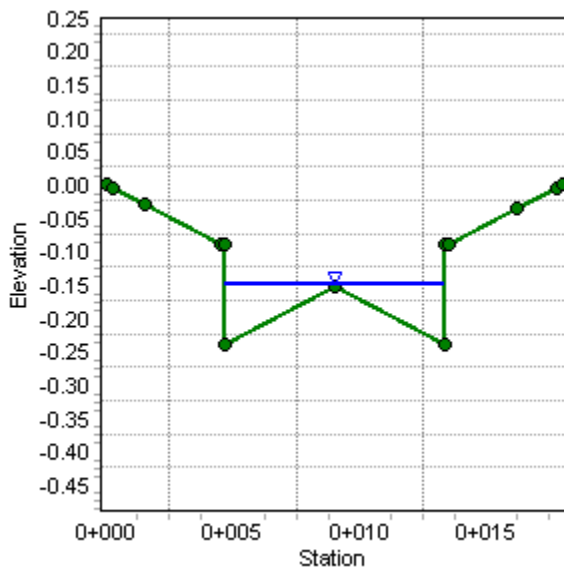
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |      |
|---------------|---------|------|
| Channel Slope | 0.95000 | %    |
| Normal Depth  | 0.09    | m    |
| Discharge     | 0.38    | m³/s |

### Cross Section Image



## Worksheet for XSEC B-B - 24m ROW with 2% boulevard

### Project Description

Friction Method                      Manning Formula  
Solve For                              Normal Depth

### Input Data

Channel Slope                                              1.48000    %  
Discharge                                                0.55    m³/s  
Section Definitions

| Station (m) | Elevation (m) |
|-------------|---------------|
| 0+000       | 0.00          |
| 0+000.5     | -0.01         |
| 0+002.5     | -0.05         |
| 0+006.5     | -0.13         |
| 0+006.65    | -0.13         |
| 0+006.7     | -0.28         |
| 0+012       | -0.17         |
| 0+017.3     | -0.28         |
| 0+017.35    | -0.13         |
| 0+017.5     | -0.13         |
| 0+021.5     | -0.05         |
| 0+023.5     | -0.01         |
| 0+024       | 0.00          |

### Roughness Segment Definitions

| Start Station     | Ending Station    | Roughness Coefficient |
|-------------------|-------------------|-----------------------|
| (0+000, 0.00)     | (0+000.5, -0.01)  | 0.025                 |
| (0+000.5, -0.01)  | (0+002.5, -0.05)  | 0.013                 |
| (0+002.5, -0.05)  | (0+006.5, -0.13)  | 0.025                 |
| (0+006.5, -0.13)  | (0+006.65, -0.13) | 0.013                 |
| (0+006.65, -0.13) | (0+006.7, -0.28)  | 0.013                 |
| (0+006.7, -0.28)  | (0+012, -0.17)    | 0.013                 |
| (0+012, -0.17)    | (0+017.3, -0.28)  | 0.013                 |
| (0+017.3, -0.28)  | (0+017.35, -0.13) | 0.013                 |



## Worksheet for XSEC B-B - 24m ROW with 2% boulevard

### Input Data

| Start Station     | Ending Station   | Roughness Coefficient |
|-------------------|------------------|-----------------------|
| (0+017.35, -0.13) | (0+017.5, -0.13) | 0.013                 |
| (0+017.5, -0.13)  | (0+021.5, -0.05) | 0.025                 |
| (0+021.5, -0.05)  | (0+023.5, -0.01) | 0.013                 |
| (0+023.5, -0.01)  | (0+024, 0.00)    | 0.025                 |

### Results

|                  |                     |                |
|------------------|---------------------|----------------|
| Normal Depth     | 0.10                | m              |
| Elevation Range  | -0.2800 to 0.0000 m |                |
| Flow Area        | 0.45                | m <sup>2</sup> |
| Wetted Perimeter | 9.4511              | m              |
| Top Width        | 9.3108              | m              |
| Normal Depth     | 0.10                | m              |
| Critical Depth   | 0.12                | m              |
| Critical Slope   | 0.00423             | m/m            |
| Velocity         | 1.22                | m/s            |
| Velocity Head    | 0.08                | m              |
| Specific Energy  | 0.17                | m              |
| Froude Number    | 1.78                |                |
| Flow Type        | Supercritical       |                |

### GVF Input Data

|                  |        |   |
|------------------|--------|---|
| Downstream Depth | 0.00   | m |
| Length           | 0.0000 | m |
| Number Of Steps  | 0      |   |

### GVF Output Data

|                     |          |     |
|---------------------|----------|-----|
| Upstream Depth      | 0.00     | m   |
| Profile Description |          |     |
| Profile Headloss    | 0.00     | m   |
| Downstream Velocity | Infinity | m/s |
| Upstream Velocity   | Infinity | m/s |
| Normal Depth        | 0.10     | m   |
| Critical Depth      | 0.12     | m   |
| Channel Slope       | 0.01480  | m/m |
| Critical Slope      | 0.00423  | m/m |

## Cross Section for XSEC B-B - 24m ROW with 2% boulevard

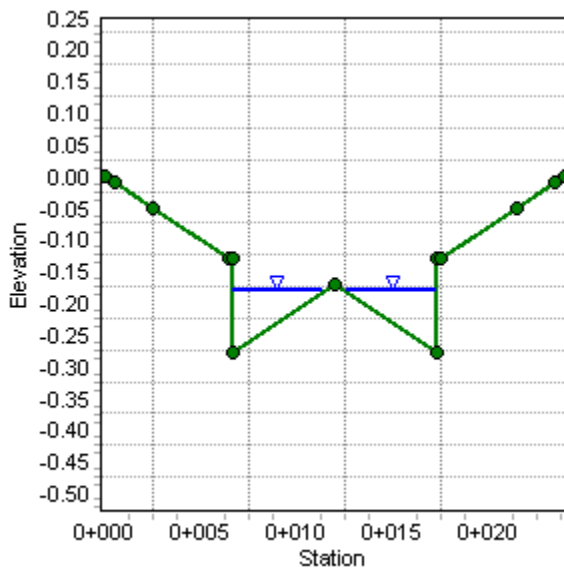
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |                   |
|---------------|---------|-------------------|
| Channel Slope | 1.48000 | %                 |
| Normal Depth  | 0.10    | m                 |
| Discharge     | 0.55    | m <sup>3</sup> /s |

### Cross Section Image



## Project Description

### Input Data

| Station (m) | Elevation (m) |
|-------------|---------------|
| 0           | 100.00        |
| 10          | 100.00        |
| 20          | 100.00        |
| 30          | 100.00        |
| 40          | 100.00        |
| 50          | 100.00        |
| 60          | 100.00        |
| 70          | 100.00        |
| 80          | 100.00        |
| 90          | 100.00        |
| 100         | 100.00        |

### Roughness Segment Definitions

|                   |                   |       |
|-------------------|-------------------|-------|
| (0+000, 0.00)     | (0+001.2, 0.00)   | 0.013 |
| (0+001.2, 0.00)   | (0+001.85, -0.22) | 0.013 |
| (0+001.85, -0.22) | (0+003.85, -0.22) | 0.013 |
| (0+003.85, -0.22) | (0+004.5, 0.00)   | 0.013 |
| (0+004.5, 0.00)   | (0+005.7, 0.00)   | 0.013 |

## Results

**Bentley Systems, Inc. Haestad Methods Solution Center**

**Bentley FlowMaster [08.01.071.00]**



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## Worksheet for XSEC D-D - 18m ROW with 2% boulevard

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### Results

|                 |               |     |
|-----------------|---------------|-----|
| Velocity        | 1.94          | m/s |
| Velocity Head   | 0.19          | m   |
| Specific Energy | 0.34          | m   |
| Froude Number   | 1.75          |     |
| Flow Type       | Supercritical |     |

### GVF Input Data

|                  |        |   |
|------------------|--------|---|
| Downstream Depth | 0.00   | m |
| Length           | 0.0000 | m |
| Number Of Steps  | 0      |   |

### GVF Output Data

|                     |          |     |
|---------------------|----------|-----|
| Upstream Depth      | 0.00     | m   |
| Profile Description |          |     |
| Profile Headloss    | 0.00     | m   |
| Downstream Velocity | Infinity | m/s |
| Upstream Velocity   | Infinity | m/s |
| Normal Depth        | 0.15     | m   |
| Critical Depth      | 0.23     | m   |
| Channel Slope       | 0.01040  | m/m |
| Critical Slope      | 0.00348  | m/m |

## Cross Section for XSEC D-D - 18m ROW with 2% boulevard

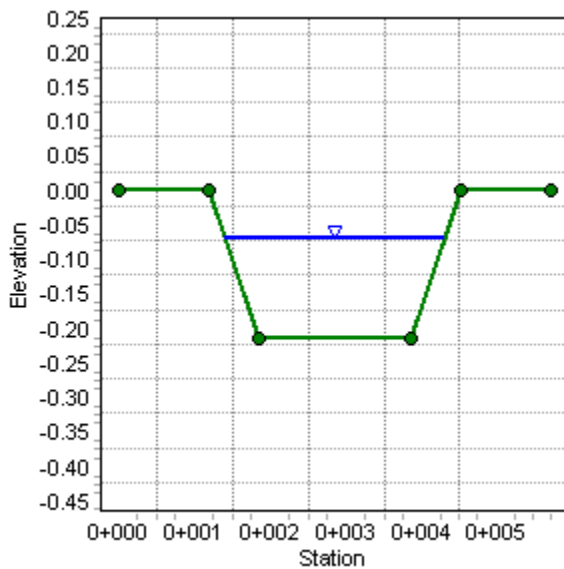
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |      |
|---------------|---------|------|
| Channel Slope | 1.04000 | %    |
| Normal Depth  | 0.15    | m    |
| Discharge     | 0.70    | m³/s |

### Cross Section Image



## Worksheet for XSEC C-C - 24m ROW with 2% boulevard

### Project Description

Friction Method                      Manning Formula  
Solve For                              Normal Depth

### Input Data

Channel Slope                                              1.48000    %  
Discharge                                                 1.34    m³/s  
Section Definitions

| Station (m) | Elevation (m) |
|-------------|---------------|
| 0+000       | 0.00          |
| 0+000.5     | -0.01         |
| 0+002.5     | -0.05         |
| 0+006.5     | -0.13         |
| 0+006.65    | -0.13         |
| 0+006.7     | -0.28         |
| 0+012       | -0.17         |
| 0+017.3     | -0.28         |
| 0+017.35    | -0.13         |
| 0+017.5     | -0.13         |
| 0+021.5     | -0.05         |
| 0+023.5     | -0.01         |
| 0+024       | 0.00          |

### Roughness Segment Definitions

| Start Station     | Ending Station    | Roughness Coefficient |
|-------------------|-------------------|-----------------------|
| (0+000, 0.00)     | (0+000.5, -0.01)  | 0.025                 |
| (0+000.5, -0.01)  | (0+002.5, -0.05)  | 0.013                 |
| (0+002.5, -0.05)  | (0+006.5, -0.13)  | 0.025                 |
| (0+006.5, -0.13)  | (0+006.65, -0.13) | 0.013                 |
| (0+006.65, -0.13) | (0+006.7, -0.28)  | 0.013                 |
| (0+006.7, -0.28)  | (0+012, -0.17)    | 0.013                 |
| (0+012, -0.17)    | (0+017.3, -0.28)  | 0.013                 |
| (0+017.3, -0.28)  | (0+017.35, -0.13) | 0.013                 |



## Worksheet for XSEC C-C - 24m ROW with 2% boulevard

### Input Data

| Start Station     | Ending Station   | Roughness Coefficient |
|-------------------|------------------|-----------------------|
| (0+017.35, -0.13) | (0+017.5, -0.13) | 0.013                 |
| (0+017.5, -0.13)  | (0+021.5, -0.05) | 0.025                 |
| (0+021.5, -0.05)  | (0+023.5, -0.01) | 0.013                 |
| (0+023.5, -0.01)  | (0+024, 0.00)    | 0.025                 |

### Results

|                  |                     |                |
|------------------|---------------------|----------------|
| Normal Depth     | 0.13                | m              |
| Elevation Range  | -0.2800 to 0.0000 m |                |
| Flow Area        | 0.81                | m <sup>2</sup> |
| Wetted Perimeter | 10.8778             | m              |
| Top Width        | 10.6871             | m              |
| Normal Depth     | 0.13                | m              |
| Critical Depth   | 0.18                | m              |
| Critical Slope   | 0.00366             | m/m            |
| Velocity         | 1.66                | m/s            |
| Velocity Head    | 0.14                | m              |
| Specific Energy  | 0.27                | m              |
| Froude Number    | 1.92                |                |
| Flow Type        | Supercritical       |                |

### GVF Input Data

|                  |        |   |
|------------------|--------|---|
| Downstream Depth | 0.00   | m |
| Length           | 0.0000 | m |
| Number Of Steps  | 0      |   |

### GVF Output Data

|                     |          |     |
|---------------------|----------|-----|
| Upstream Depth      | 0.00     | m   |
| Profile Description |          |     |
| Profile Headloss    | 0.00     | m   |
| Downstream Velocity | Infinity | m/s |
| Upstream Velocity   | Infinity | m/s |
| Normal Depth        | 0.13     | m   |
| Critical Depth      | 0.18     | m   |
| Channel Slope       | 0.01480  | m/m |
| Critical Slope      | 0.00366  | m/m |

## Cross Section for XSEC C-C - 24m ROW with 2% boulevard

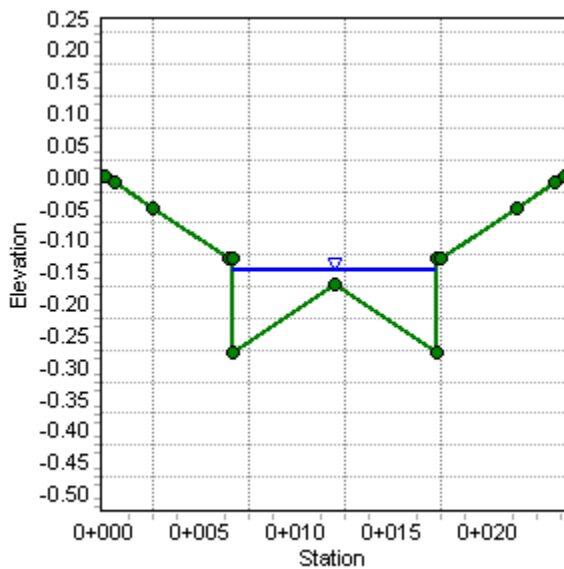
### Project Description

|                 |                 |
|-----------------|-----------------|
| Friction Method | Manning Formula |
| Solve For       | Normal Depth    |

### Input Data

|               |         |      |
|---------------|---------|------|
| Channel Slope | 1.48000 | %    |
| Normal Depth  | 0.13    | m    |
| Discharge     | 1.34    | m³/s |

### Cross Section Image







## Existing Phosphorus Budget

Watershed Hewitts Creek

| To: Hewitt's Creek - Catchment 101 & Catchment 104 |                          |           |                    |
|----------------------------------------------------|--------------------------|-----------|--------------------|
| Land Cover                                         | TP Loading<br>(kg/ha/yr) | Area (ha) | TP Loading (kg/yr) |
| Cropland                                           | 0.19                     | 2.37      | 0.45               |
| Hay-Pasture                                        |                          |           | 0.00               |
| Sod Farm/Golf Course                               |                          |           | 0.00               |
| High Industrial Dev. - Commercial/Industrial       |                          |           | 0.00               |
| High Industrial Dev. - Residential                 |                          |           | 0.00               |
| Low Intensity Development                          |                          |           | 0.00               |
| Quarry                                             |                          |           | 0.00               |
| Unpaved Road                                       |                          |           | 0.00               |
| Forest                                             |                          |           | 0.00               |
| Transitional                                       |                          |           | 0.00               |
| Wetland                                            |                          |           | 0.00               |
| Open Water                                         |                          |           | 0.00               |

## Existing Phosphorus Budget

Watershed **Lovers Creek**

| <b>To: Lover's Creek - Catchment 102 &amp; Catchment 103</b> |                          |           |                    |
|--------------------------------------------------------------|--------------------------|-----------|--------------------|
| Land Cover                                                   | TP Loading<br>(kg/ha/yr) | Area (ha) | TP Loading (kg/yr) |
| Cropland                                                     | 0.16                     | 21.32     | 3.41               |
| Hay-Pasture                                                  |                          |           | 0.00               |
| Sod Farm/Golf Course                                         |                          |           | 0.00               |
| High Industrial Dev. - Commercial/Industrial                 |                          |           | 0.00               |
| High Industrial Dev. - Residential                           |                          |           | 0.00               |
| Low Intensity Development                                    |                          |           | 0.00               |
| Quarry                                                       |                          |           | 0.00               |
| Unpaved Road                                                 |                          |           | 0.00               |
| Forest                                                       |                          |           | 0.00               |
| Transitional                                                 |                          |           | 0.00               |
| Wetland                                                      |                          |           | 0.00               |
| Open Water                                                   |                          |           | 0.00               |

## Proposed Conditions Phosphorus Budget

Watershed Hewitts Creek

| To: Hewitt's Creek - Catchment 204          |                          |             |                       | BMP #1                         |                        |                      | BMP #2 |                        |                      |
|---------------------------------------------|--------------------------|-------------|-----------------------|--------------------------------|------------------------|----------------------|--------|------------------------|----------------------|
| Land Cover                                  | TP Loading<br>(kg/ha/yr) | Area (ha)   | TP Loading<br>(kg/yr) | BMP                            | TP Removal Rate<br>(%) | TP Export<br>(kg/yr) | BMP    | TP Removal<br>Rate (%) | TP Export<br>(kg/yr) |
| Cropland                                    | 0.19                     | 3.16        | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Hay-Pasture                                 | 0.07                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Sod Farm/Golf Course                        | 0.12                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| High Intensity Dev. - Commercial/Industrial | 1.82                     |             | 5.75                  | Infiltration (25 mm of runoff) | 100%                   | 5.75                 | None   | 0%                     | 0.00                 |
| High Intensity Dev. - Residential           | 1.32                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Low Intensity Development                   | 0.13                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Quarry                                      | 0.08                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Unpaved Road                                | 0.83                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Forest                                      | 0.05                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Transitional                                | 0.06                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Wetland                                     | 0.05                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| Open Water                                  | 0.26                     |             | 0.00                  | None                           | 0%                     | 0.00                 | None   | 0%                     | 0.00                 |
| <b>Total</b>                                |                          | <b>3.16</b> | <b>5.75</b>           |                                |                        |                      |        |                        | <b>0.00</b>          |



**Proposed Conditions Phosphorus Budget**

Watershed **Lovers Creek**

| To: <b>Lover's Creek - Catchment 201, 202, and 203</b> |                          |              |                       | BMP #1                                  |                        |                      | BMP #2                               |                        |                      | BMP #3                               |                        |                      |
|--------------------------------------------------------|--------------------------|--------------|-----------------------|-----------------------------------------|------------------------|----------------------|--------------------------------------|------------------------|----------------------|--------------------------------------|------------------------|----------------------|
| Land Cover                                             | TP Loading<br>(kg/ha/yr) | Area (ha)    | TP Loading<br>(kg/yr) | BMP                                     | TP Removal Rate<br>(%) | TP Export<br>(kg/yr) | BMP                                  | TP Removal<br>Rate (%) | TP Export<br>(kg/yr) | BMP                                  | TP Removal<br>Rate (%) | TP Export<br>(kg/yr) |
| Cropland                                               | 0.16                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Hay-Pasture                                            | 0.07                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Sod Farm/Golf Course                                   | 0.17                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| High Intensity Dev. - Commercial/Industrial            | 1.82                     | 3.23         | 5.88                  | Infiltration (25 mm of runoff)          | 100%                   | 5.88                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| High Intensity Dev. - Residential                      | 1.32                     | 2.85         | 3.76                  | Dry Detention Ponds                     | 20%                    | 3.01                 | Specialized Phosphorus Media Filters | 70%                    | 0.90                 | None                                 | 0%                     | 0.90                 |
| High Intensity Dev. - Residential                      | 1.32                     | 0.26         | 0.34                  | Vegetated Filter Strips / Buffer Strips | 20%                    | 0.27                 | Dry Detention Ponds                  | 20%                    | 0.22                 | Specialized Phosphorus Media Filters | 70%                    | 0.07                 |
| High Intensity Dev. - Residential                      | 1.32                     | 9.34         | 12.33                 | Infiltration (25 mm of runoff)          | 100%                   | 12.33                | Dry Detention Ponds                  | 20%                    | 0.00                 | Specialized Phosphorus Media Filters | 70%                    | 0.00                 |
| High Intensity Dev. - Residential                      | 1.32                     | 0.41         | 0.54                  | Vegetated Filter Strips / Buffer Strips | 20%                    | 0.43                 | Dry Detention Ponds                  | 20%                    | 0.35                 | Specialized Phosphorus Media Filters | 70%                    | 0.10                 |
| High Intensity Dev. - Residential                      | 1.32                     | 4.44         | 5.86                  | Dry Detention Ponds                     | 20%                    | 4.69                 | Specialized Phosphorus Media Filters | 70%                    | 1.41                 | None                                 | 0%                     | 1.41                 |
| Low Intensity Development                              | 0.07                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Quarry                                                 | 0.06                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Unpaved Road                                           | 0.83                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Forest                                                 | 0.06                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Transitional                                           | 0.06                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Wetland                                                | 0.05                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| Open Water                                             | 0.26                     |              | 0.00                  | None                                    | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 | None                                 | 0%                     | 0.00                 |
| <b>Total</b>                                           |                          | <b>20.53</b> | <b>28.71</b>          |                                         |                        |                      |                                      |                        |                      |                                      |                        | <b>2.48</b>          |

### **Lake Simcoe Phosphorous Offsetting Policy Calculation**

Phosphorus Export = 2.48 kg/yr  
Offset Ratio = 2.5 :1  
Offsetting Value = \$ 35,770.00 /kg/year  
Offsetting Cost = \$ 221,709.33

Administration Fee = 15%  
\$ 33,256.40

**TOTAL PHOSPHORUS OFFSETTING FEE = \$ 254,965.73**

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## **Appendix D      Water Supply Analysis Report**

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February 8, 2022

Project No. 17002-58

Sent via email  
Mr. Paul Sarta  
Rainsong Land Development Inc.  
c/o SCS Consulting Group  
30 Centurian Drive, Suite 100  
Markham ON  
L3R 8B8

**Subject: Rainsong Phase 2 Watermain Analysis  
City of Barrie**

Dear Mr. Sarta,

We are pleased to submit our report entitled "Rainsong Phase 2 Watermain Analysis Update" outlining the results of our water distribution analysis for a residential development in the City of Barrie.

This development was incorporated into the City's Infowater model and modeled utilizing the design information provided to Municipal Engineering Solutions. The findings of our analysis are summarized in the following report.

We trust you find this report satisfactory. Should you have any questions or require further clarification, please call.

Yours truly,

**Municipal Engineering Solutions**

A handwritten signature in black ink that reads "John C. Bourrie". The signature is fluid and cursive, with the first name "John" being the most prominent.

Per: John C. Bourrie, P.Eng.

/LMC

File Location: D:\Projects\2019\19-022 Rainsong Barrie SCS 17002-58\3.0 Report\Final Phase 2 Report Feb 2022\17002-58 Rainsong Watermain Analysis\_20220208.docx

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# **RAINSONG PHASE 2 WATERMAIN ANALYSIS UPDATE**

**PREPARED BY:**

**MUNICIPAL ENGINEERING SOLUTIONS**



**FOR:**

**RAINSONG LAND DEVELOPMENT INC.**  
February 2022

**Project Number: 17002-58**

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## APPENDICES

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| <b>Appendix A</b> | <b>Demands</b>       |
| <b>Appendix B</b> | <b>Model Results</b> |



## Section 1 – INTRODUCTION

Municipal Engineering Solutions (“MES”) was retained by Rainsong Land Development Inc. to conduct a hydraulic water analysis for the proposed Rainsong Phase 2 Development located in the City of Barrie. As part of this hydraulic assessment MES was requested to undertake the following:

1. Calculate/verify water demands for the proposed development using City of Barrie, provincial and industry design standards;
2. Add the subject watermain/development/boundary information to development water model;
3. Run the model to size the subject mains to achieve service criteria during Average Day, and fire flow during Maximum Day demand; and
4. Prepare a Report summarizing the modeling results for agency review and design purposes.

### 1.1 Development Background

The Rainsong Phase 2 site is located on the north side of Lockhart Road, west of Yonge Street in the City of Barrie. The residential development consists of 194 detached homes, 118 semi-detached homes, 155 townhomes, and institutional areas. The demands for the site are shown in **Appendix A**. The proposed development and phasing are shown below on **Figure 1**.

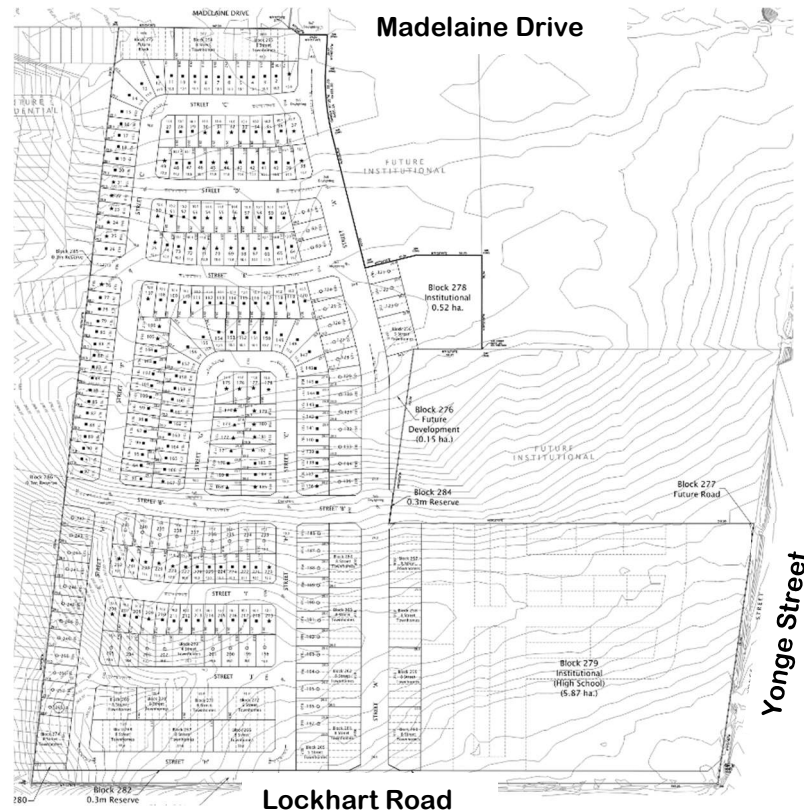


Figure 1 - Proposed Rainsong Phase 2 Development

## Section 2 – WATERMAIN DESIGN CRITERIA

The design criteria utilized to estimate the water demands for the hydraulic water model follows general industry standards and is calculated using the design criteria and guidelines outlined in the City of Barrie Water Transmission & Distribution Design Standard, the City of Barrie Water Storage and Distribution Master Plan, August 2021, the Ministry of the Environment Conservation and Parks (MECP) Watermain Design Criteria, and the Fire Underwriters Survey.

The following sections summarize the specific design criteria used to carry out the hydraulic watermain assessment for this development.

### 2.1 Equivalent Population Densities & Water Design Factors

To calculate the equivalent population and water design factors for this development MES used City of Barrie standard population densities as noted in the “*Water Transmission & Distribution Design Standard January 2021*”. **Table 1** summarizes the population densities and **Table 2** summarizes the average daily demand and peaking factors used for this analysis.

**Table 1 – Equivalent Population Density**

| Type of Development | Equivalent Population (Persons/Unit) |
|---------------------|--------------------------------------|
| Single Family       | 3.25                                 |
| Townhouse           | 2.57                                 |
| Apartment           | 1.67                                 |

Source: Water Transmission & Distribution Design Standard August 2021

**Table 2 - Water Design Factors**

| Type of Development | Average Daily Demand (L per capita) | Maximum Daily Demand Peaking Factor |
|---------------------|-------------------------------------|-------------------------------------|
| Residential & ICI   | 225                                 | 2.5                                 |

Source: Water Transmission & Distribution Design Standard August 2021 and MECP

## Section 3 –FLOW DEMANDS

Utilizing the equivalent population data from Table 1 and the corresponding Average Day, Maximum Day and Peak Hour data from Table 2 the water demands for this development were calculated.

### 3.1 Equivalent Population Flow Demands

The calculated demands for the development are summarized in **Table 3**. For additional details on the development water demands and assigned demand nodes used in the water model see **Appendix A**.

**Table 3 – Water Demand for Rainsong Phase 2 Development**

|        | Average Day Demand (L/S) | Maximum Day Demand (L/S) |
|--------|--------------------------|--------------------------|
| Total* | 6.57                     | 16.44                    |

\*includes Phase 1 school demands

### 3.2 Fire Flow Demands

The City of Barrie Engineering Design Standards & Criteria, requests that fire demands be calculated using the Fire Underwriter's Survey where possible. Since the detailed design data (specifics) for the proposed development are not known at this time, the typical fire flows from the criteria were used. The fire flows are shown in **Table 4**.

**Table 4 - Fire Flow Requirements**

| Type of Development | Fire Flow (L/S) |
|---------------------|-----------------|
| Single Family Homes | 100             |
| Townhomes           | 155             |
| Institutional       | 200             |

Source: City of Barrie Water Transmission & Distribution Design Standard August 2021

### **3.3 External Demands**

The water model provided by the City contained external demands.

## **Section 4 – OTHER SYSTEM REQUIREMENTS**

### **4.1 System Pressure Requirements**

In addition to meeting the various flow requirements, the system must also satisfy minimum and maximum pressure requirements as outlined by the City of Barrie. The City's pressure requirements are outlined in the Design Criteria and stipulate the following:

1. The minimum system pressure shall not be less than 140 kPa (20 psi) at any point in the water system under fire flow conditions.
2. The minimum pressure shall be 275 kPa (40 psi).
3. The preferred operating pressure range shall be 350 to 485 kPa (50 to 70 psi).
4. The maximum pressure shall be 700 kPa (100 psi). Pressure reducing valves may need to be installed on individual services to meet the OBC maximum pressure of 550 kPa (80 psi).

### **4.2 Watermain Sizing**

The City of Barrie also stipulates that all watermains are adequately sized to maintain demand flows at the required pressures without causing excessive energy loss or result in water quality decay. The watermain system must therefore be designed to accommodate the Maximum day plus fire demand.

For distribution systems providing fire protection the minimum pipe size shall be 150 mm diameter in accordance with Ministry of the Environment Conservation and Parks (MECP) and NFPA requirements.

To provide appropriate fire protection, reliable supply and pressures the water distribution system should be looped wherever possible to improve supply security and water quality and, also, have two connections to the existing system where possible.

### **4.3 Watermain C-Factor**

In designing and modeling of the pipes the Coefficient of Roughness (C-Factor) factors from the City's design manual were utilized. The Coefficient of Roughness assigned to each pipe size is summarized in **Table 5** below.

**Table 5 - Hazen-Williams Coefficient of Roughness (C-Factors)**

| Size of Pipe (Diameter in mm) | Coefficient of Roughness (C) |
|-------------------------------|------------------------------|
| 150 mm                        | 100                          |
| 200 mm to 250 mm              | 110                          |
| 300 mm to 600 mm              | 120                          |
| Greater Than 600 mm           | 130                          |

Source: City of Barrie Water Transmission & Distribution Design Standard August 2021



## Section 5 – ANALYSIS & MODELING RESULTS

To conduct the hydraulic water analysis for the proposed development the water demands were estimated by MES using the design criteria previously discussed and incorporated the demands into an InfoWater model provided by the City. The following sections discuss the model setup and results.

### 5.1 Model Setup

The City of Barrie provided an Infowater model for the City's water system. The pipes and nodes from the previously analyzed Rainsong Phase 1 site were imported into the City's model. New nodes were created for the Rainsong Phase 2 area. The institutional area, Block 278, was considered to be a part of the Phase 1 school block. Demand was added to the Phase 1 nodes for the school and included in this analysis.

Results are provided for the average day, maximum day scenarios along with the fire flows from the City's fire flow scenario. Friction factor for the pipes were assigned according to **Table 5**.

### 5.2 Watermain Sizing and System Pressures

The analysis was conducted under Average Day, Maximum Day and Maximum day plus Fire demands to size the watermains and meet the pressure requirements. The pipe size and layout are shown in **Appendix B**.

The Rainsong Phase 2 Development is located on the north side of Lockhart Road, east of Yonge Street. The watermains assumed to be in place for the development are:

- 300 mm watermain from Phase 1 on Moberly Drive;
- 300 mm watermain on Madelaine Drive from the development northwest of Rainsong Phase 2;
- 400 mm watermain along the pedestrian pathway between Thicketwood Avenue and Patrick Drive;

The watermains were sized between 150 mm to 300 mm according to the results of average day, maximum day, and maximum day plus fire. Modeled service pressures are summarized in **Table 6**.

The Phase 1 school block connections were included in this analysis as the Block 278 area was added to the school demands. With updated model, the increased demands and changes to the City's fire flow minimums, the fire connection should be increased to 250 mm from the Phase 1 sizing of 200 mm.

The pressures are within the required City of Barrie operating range under average day and maximum day demands. It should be noted that the City model does not include minimum hour or peak hour scenarios within the City's model so pressure may be higher under low demand periods and lower during high demand periods. Pressures may also drop below the City's preferred minimum pressure of 50 psi (345 kPa) during peak demand periods.

Detailed pipe and node tables for the various scenarios modelled are attached to this report in **Appendix B**.

**Table 6- Modeled Service Pressures**

| Scenario | Average Day                          | Maximum Day                          | Max. Day + Fire          |
|----------|--------------------------------------|--------------------------------------|--------------------------|
| Phase 2  | 51.4 to 70.0 psi<br>(355 to 483 kPa) | 50.1 to 69.2 psi<br>(349 to 477 kPa) | 142 to 417 L/s @ 140 kPa |

## Section 6 – CONCLUSIONS/RECOMMENDATIONS

The conclusions and recommendations are summarized below.

- The service pressures are expected to range from 50.1 to 70.0 psi (349 to 483 kPa).
- Pressures may drop below the City's preferred minimum pressure of 50 psi (345 kPa) under some operating conditions.

- The Phase 1 school fire supply connection should be upsized to 250 mm to meet the higher City suggested fire flows.
- A hydrant test must be completed following construction of the watermain and prior to the construction of any buildings to confirm the system pressures and fire flow(s) available for this development.
- The available fire flow within the site meets or exceeds the fire flow demands as noted in Table 5 at the minimum pressure of 140 kPa based on the proposed watermain configuration.
- The fire flows utilized in this analysis are based on the City's minimum fire flow requirements. The City's criteria suggests that the fire flows need to be calculated using the Fire Underwriters Survey formula when the unit construction information is known. Once the building designs/configurations for the homes and buildings are known the FUS calculation must be completed to confirm the required fire flows. The pipe sizes may need to be upsized to suit higher fire flows or the building construction designed to suit the flow available.
- Confirmation and/or changes to the criteria should also be provided to and reviewed with MES prior to the finalization of the detailed design drawings and construction of the watermain system. Final design parameters are to be provided to MES prior to construction for further review to confirm that the actual (final) site conditions and building design(s) reflect those modeled by MES within this report.
- This report, including all modeling assumptions used, is to be submitted to and reviewed by the water operating authority (municipality) to confirm that the modeling parameters used are acceptable to the operating authority and/or confirm if modified domestic or fire flow requirements are required or should be implemented for this particular development.

# Appendix A

## Demands



## Barrie Design Criteria

### Water Transmission & Distribution Policies Design Guidelines Aug 2021 (unless otherwise stated)

#### Equivalent Population by Unit

(Sanitary Sewage Collection System Policies and Design Guidelines Oct 2017 for population and Average Day Demand)

| Type of Development            | Equivalent Population Density<br>(Person/Unit) |
|--------------------------------|------------------------------------------------|
| Single Family or Semi-Detached | 3.25                                           |
| Townhouse                      | 2.57                                           |
| Apartment                      | 1.67                                           |

#### Equivalent Population by Area

| Type of Development          | Equivalent Population Density<br>(Person/Hectare) | Average Day Demands<br>(m3/ha/day) |
|------------------------------|---------------------------------------------------|------------------------------------|
| Single Family, Duplex, Semis | 78.25                                             |                                    |
| Triplex and 4-plex           | 81.9                                              |                                    |
| Townhouse                    | 110                                               |                                    |
| Apartments (>6 stories)      | 500                                               |                                    |
| Light Commercial Areas       | 124                                               | 28.00                              |
| Community Services           | 124                                               | 28.00                              |
| Light Industrial Areas       | 155                                               | 35.00                              |
| Hospitals (persons/bed)      |                                                   |                                    |

#### Water Design Factors

|                                  |       |                          |
|----------------------------------|-------|--------------------------|
| Average Daily Demand (m3/capita) | 0.225 |                          |
| Minimum Hourly Demand P.F.       | 0.45  | MECP (2001-3000 Persons) |
| Maximum Daily Demand P.F.        | 2.5   | MECP                     |
| Maximum Hourly Demand P.F.       |       |                          |
| Residential                      | 3.38  | MECP                     |
| I/C/I                            | 3.38  | MECP                     |

#### Coefficient of Roughness

| Size of Pipe (mm Dia.) | Coefficient of Roughness (C) |
|------------------------|------------------------------|
| 150                    | 100                          |
| 200-250                | 110                          |
| 300-600                | 120                          |
| Over 600               | 130                          |

#### Minimum Pipe Size

| Type of Development          | Size of Pipe (mm Dia.) |
|------------------------------|------------------------|
| Designed for Fire Protection | 150                    |
| Domestic supply only         | 75                     |

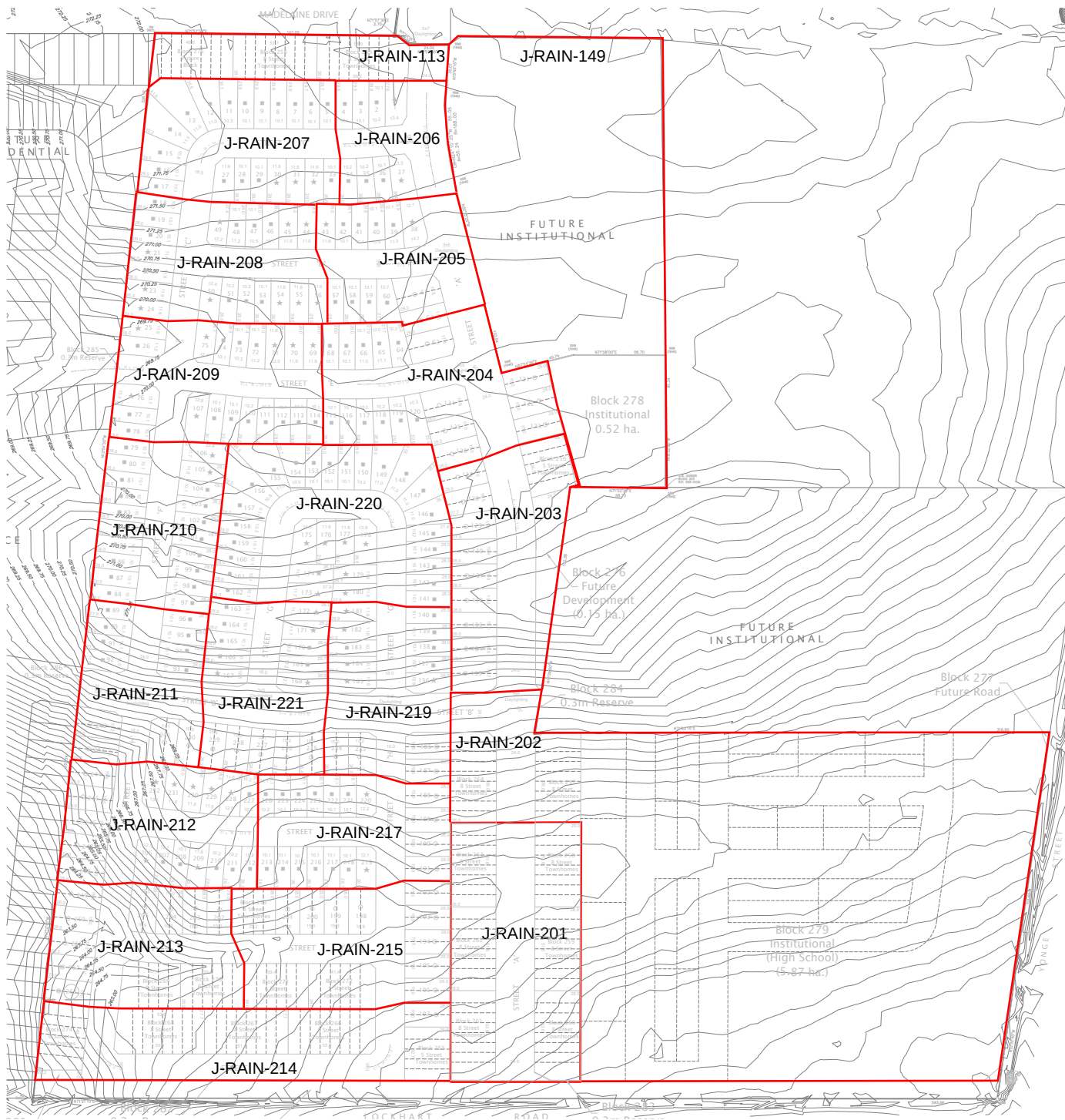
#### Working Pressures

| Parameter               | Pressure          |
|-------------------------|-------------------|
| Normal Condition        |                   |
| Minimum Pressure        | 345kPa (50 psi)   |
| Maximum (Building Code) | 550 kPa (80 psi)  |
| Maximum                 | 700 kPa (100 psi) |
| Fire Flow Conditions    |                   |
| Minimum Pressure        | 140 kPa (20 psi)  |

#### Typical Fire Flow Requirements (to be used in absence of building construction details)

| Type of Development             | Fire Demand (L/s) |
|---------------------------------|-------------------|
| Residential Low-Density         | 100               |
| Residential Medium-Density      | 155               |
| Residential High-Density        | 200               |
| Highrise Res/Downtown/Mixed Use | FUS               |
| Commercial                      | 283               |
| Institutional                   | 200               |
| Industrial                      | 333               |

# Demand Layout



**Water Demand**  
**Rainsong Phase 2, Innisfil, ON**  
**January 27, 2022**

**Solutions**

| Node        | Elevation<br>(m) | Type of Development      |                 |                      |                       | Equivalent Population             |                          | Demands      |              |              |              | Fire Flow Demands<br>(L/s) |
|-------------|------------------|--------------------------|-----------------|----------------------|-----------------------|-----------------------------------|--------------------------|--------------|--------------|--------------|--------------|----------------------------|
|             |                  | Single Family<br>(units) | Semi<br>(units) | Townhouse<br>(units) | Institutional<br>(ha) | Total Population<br>(Residential) | Total Population<br>(IC) | ADD<br>(L/s) | MHD<br>(L/s) | MDD<br>(L/s) | PHD<br>(L/s) |                            |
| J-RAIN-112  | 269.00           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         |                            |
| J-RAIN-113  | 268.65           |                          |                 | 24                   |                       | 62                                | 0                        | 0.16         | 0.07         | 0.40         | 0.54         | 155                        |
| J-RAIN-143  | 269.20           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         |                            |
| J-RAIN-147  | 269.29           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         |                            |
| J-RAIN-148  | 269.31           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         |                            |
| J-RAIN-149* | 269.30           |                          |                 |                      | 2.95                  | 0                                 | 366                      | 0.95         | 0.43         | 2.38         | 3.22         |                            |
| J-RAIN-150  | 269.30           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         | 200                        |
| J-RAIN-200  | 265.47           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         |                            |
| J-RAIN-201  | 269.20           |                          |                 | 48                   |                       | 123                               | 0                        | 0.32         | 0.14         | 0.80         | 1.09         | 155                        |
| J-RAIN-202  | 270.67           |                          |                 | 16                   | 5.87                  | 41                                | 728                      | 2.00         | 0.90         | 5.01         | 6.77         | 200                        |
| J-RAIN-203  | 272.57           |                          | 18              | 5                    | 0.15                  | 71                                | 19                       | 0.23         | 0.11         | 0.59         | 0.79         | 200                        |
| J-RAIN-204  | 272.43           | 11                       | 15              |                      |                       | 85                                | 0                        | 0.22         | 0.10         | 0.55         | 0.74         | 100                        |
| J-RAIN-205  | 272.06           | 10                       | 3               |                      |                       | 42                                | 0                        | 0.11         | 0.05         | 0.28         | 0.37         | 100                        |
| J-RAIN-206  | 269.85           | 8                        |                 |                      |                       | 26                                | 0                        | 0.07         | 0.03         | 0.17         | 0.23         | 100                        |
| J-RAIN-207  | 270.09           | 20                       |                 |                      |                       | 65                                | 0                        | 0.17         | 0.08         | 0.42         | 0.57         | 100                        |
| J-RAIN-208  | 270.55           | 20                       |                 |                      |                       | 65                                | 0                        | 0.17         | 0.08         | 0.42         | 0.57         | 100                        |
| J-RAIN-209  | 270.13           | 20                       |                 |                      |                       | 65                                | 0                        | 0.17         | 0.08         | 0.42         | 0.57         | 100                        |
| J-RAIN-210  | 268.00           | 20                       |                 |                      |                       | 65                                | 0                        | 0.17         | 0.08         | 0.42         | 0.57         | 100                        |
| J-RAIN-211  | 267.20           | 8                        | 8               |                      |                       | 52                                | 0                        | 0.14         | 0.06         | 0.34         | 0.46         | 100                        |
| J-RAIN-212  | 267.58           | 13                       | 10              |                      |                       | 75                                | 0                        | 0.19         | 0.09         | 0.49         | 0.66         | 100                        |
| J-RAIN-213  | 265.91           |                          | 18              | 11                   |                       | 87                                | 0                        | 0.23         | 0.10         | 0.56         | 0.76         | 155                        |
| J-RAIN-214  | 266.40           |                          | 2               | 35                   |                       | 96                                | 0                        | 0.25         | 0.11         | 0.63         | 0.85         | 155                        |
| J-RAIN-215  | 267.83           |                          | 18              | 16                   |                       | 100                               | 0                        | 0.26         | 0.12         | 0.65         | 0.88         | 155                        |
| J-RAIN-216  | 266.62           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         | 155                        |
| J-RAIN-217  | 268.60           | 14                       | 8               |                      |                       | 72                                | 0                        | 0.19         | 0.08         | 0.47         | 0.63         | 100                        |
| J-RAIN-218  | 267.90           |                          |                 |                      |                       | 0                                 | 0                        | 0.00         | 0.00         | 0.00         | 0.00         | 100                        |
| J-RAIN-219  | 268.72           | 10                       | 8               |                      |                       | 59                                | 0                        | 0.15         | 0.07         | 0.38         | 0.51         | 100                        |
| J-RAIN-220  | 269.56           | 30                       |                 |                      |                       | 98                                | 0                        | 0.25         | 0.11         | 0.63         | 0.86         | 100                        |
| J-RAIN-221  | 268.31           | 10                       | 10              |                      |                       | 65                                | 0                        | 0.17         | 0.08         | 0.42         | 0.57         | 100                        |

\*includes Phase 1 area

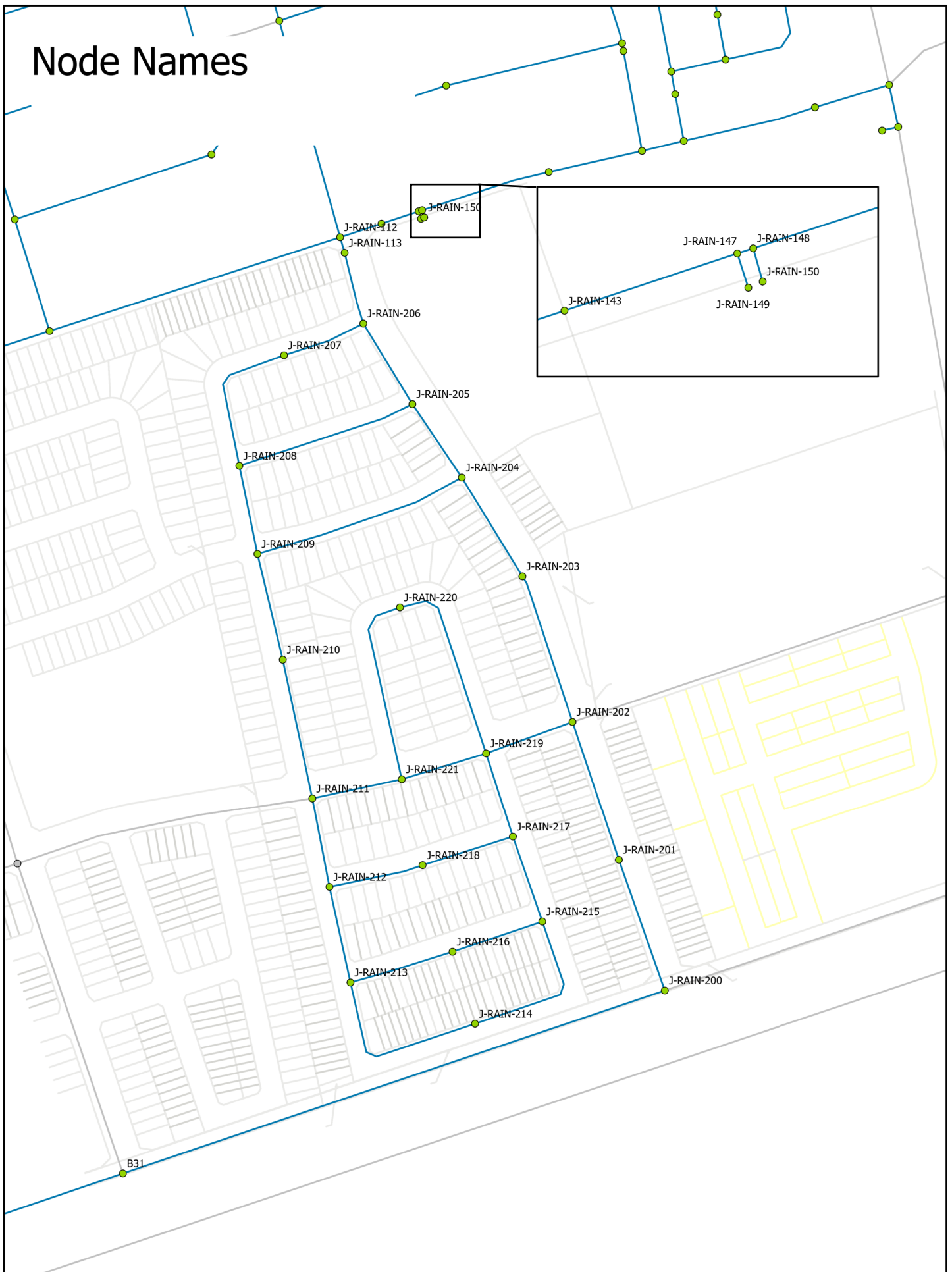
|              |  |            |            |            |             |             |             |             |             |              |              |  |
|--------------|--|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|--|
| <b>Total</b> |  | <b>194</b> | <b>118</b> | <b>155</b> | <b>8.97</b> | <b>1412</b> | <b>1112</b> | <b>6.57</b> | <b>2.96</b> | <b>16.44</b> | <b>22.22</b> |  |
|--------------|--|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|--|



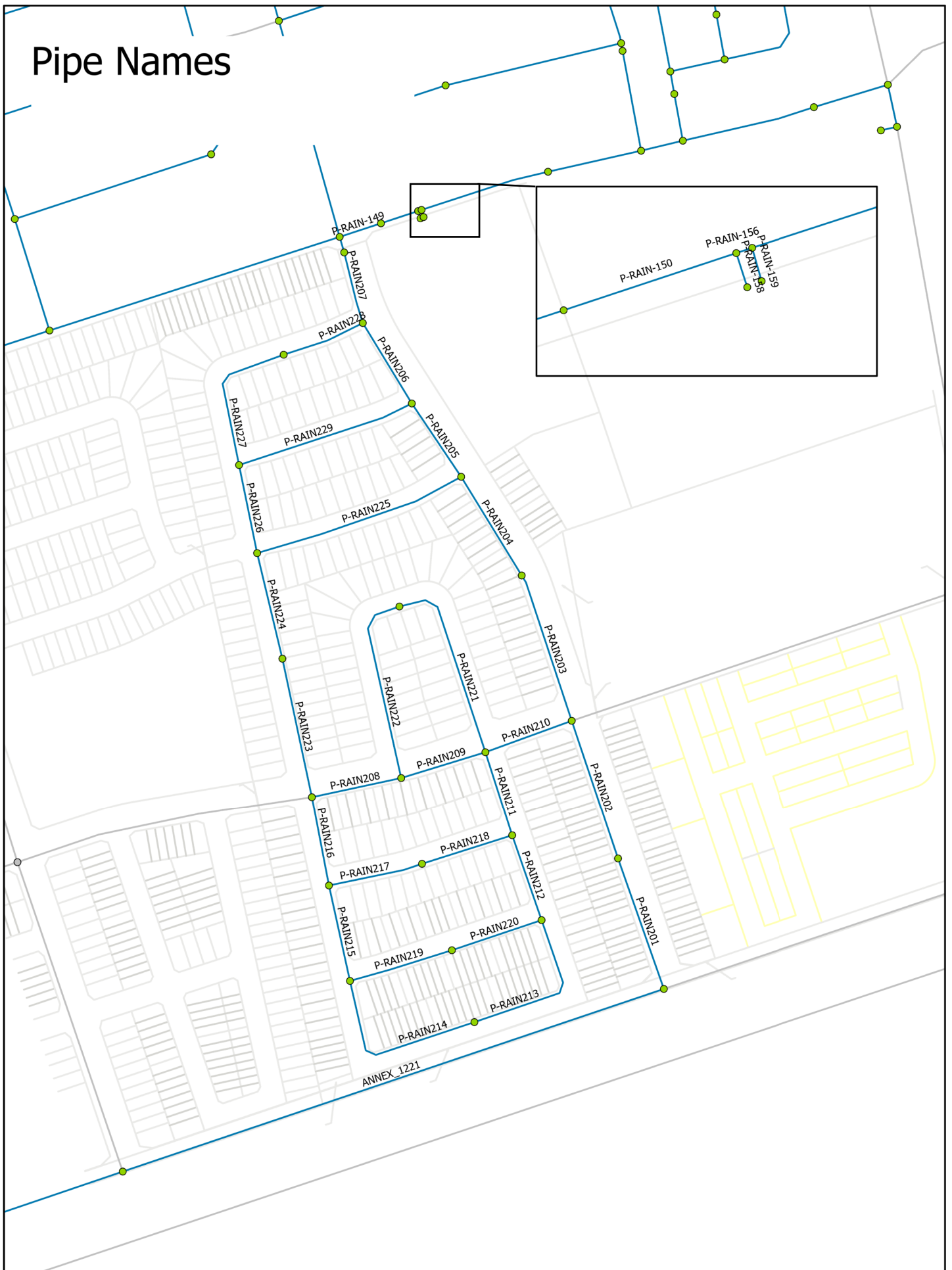
# Appendix B

## Model Results

# Node Names

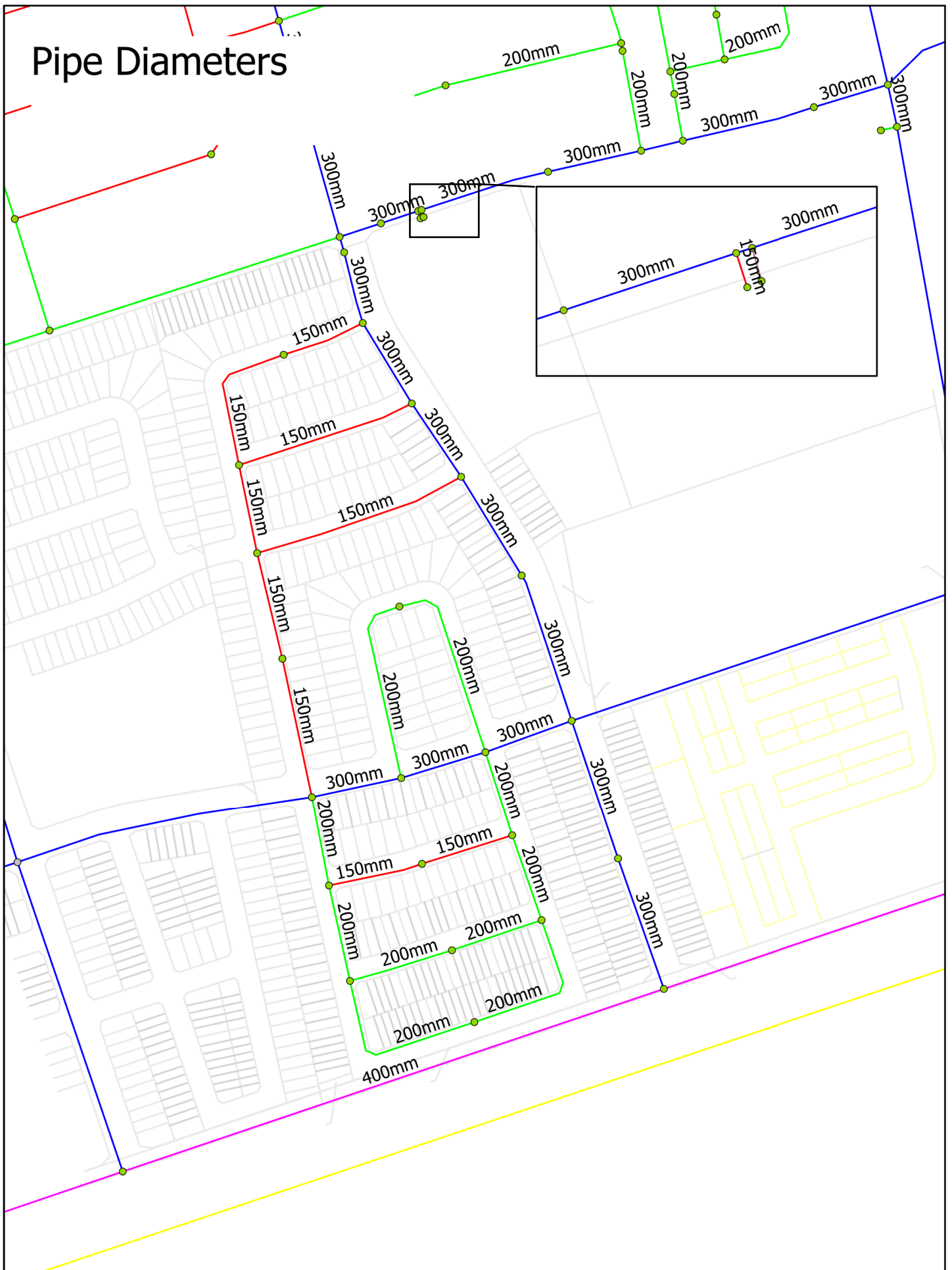


# Pipe Names





# Pipe Diameters



Page 1 of 4

Page 2 of 4



| Fire Flow Table |              |                |                |
|-----------------|--------------|----------------|----------------|
| ID              | Total Demand | Available Flow | Fire Flow Met? |
|                 | (L/s)        | (L/s)          |                |
| J-RAIN-113      | 155.40       | 416.92         | TRUE           |
| J-RAIN-150      | 200.00       | 245.42         | TRUE           |
| J-RAIN-201      | 155.80       | 319.42         | TRUE           |
| J-RAIN-202      | 205.01       | 321.81         | TRUE           |
| J-RAIN-203      | 200.59       | 310.47         | TRUE           |
| J-RAIN-204      | 100.55       | 325.06         | TRUE           |
| J-RAIN-205      | 100.28       | 341.65         | TRUE           |
| J-RAIN-206      | 100.17       | 382.59         | TRUE           |
| J-RAIN-207      | 100.42       | 144.17         | TRUE           |
| J-RAIN-208      | 100.42       | 169.62         | TRUE           |
| J-RAIN-209      | 100.42       | 166.68         | TRUE           |
| J-RAIN-210      | 100.42       | 141.88         | TRUE           |
| J-RAIN-211      | 100.34       | 290.60         | TRUE           |
| J-RAIN-212      | 100.49       | 235.14         | TRUE           |
| J-RAIN-213      | 155.56       | 218.37         | TRUE           |
| J-RAIN-214      | 155.63       | 184.66         | TRUE           |
| J-RAIN-215      | 155.65       | 210.54         | TRUE           |
| J-RAIN-216      | 155.00       | 197.93         | TRUE           |
| J-RAIN-217      | 100.47       | 233.00         | TRUE           |
| J-RAIN-218      | 100.00       | 152.93         | TRUE           |
| J-RAIN-219      | 100.38       | 304.79         | TRUE           |
| J-RAIN-220      | 100.63       | 207.66         | TRUE           |
| J-RAIN-221      | 100.42       | 294.52         | TRUE           |

|     |        |
|-----|--------|
| MIN | 141.88 |
| MAX | 416.92 |

# Fire Flow

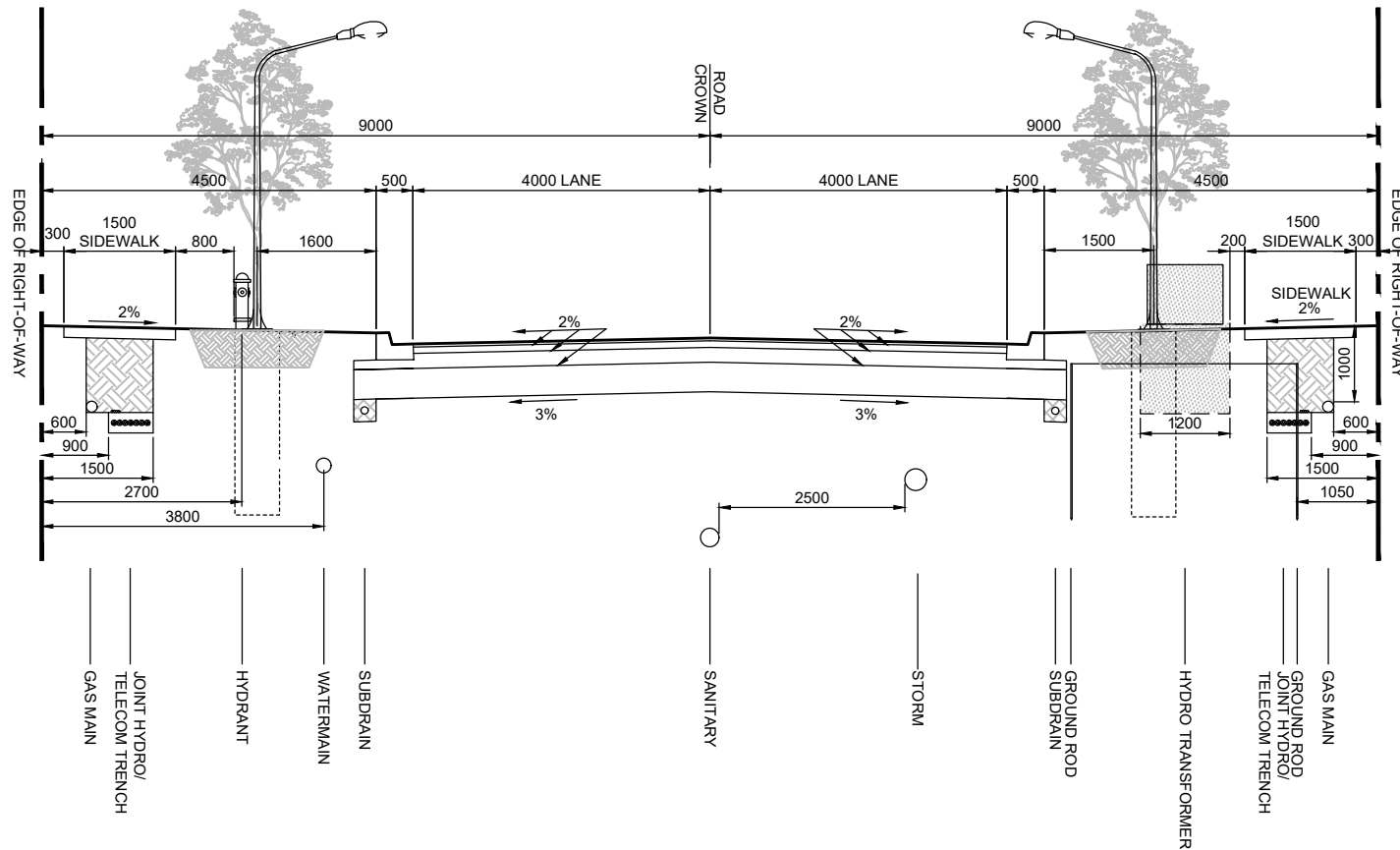


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## **Appendix E      Right-of-Way Concepts**

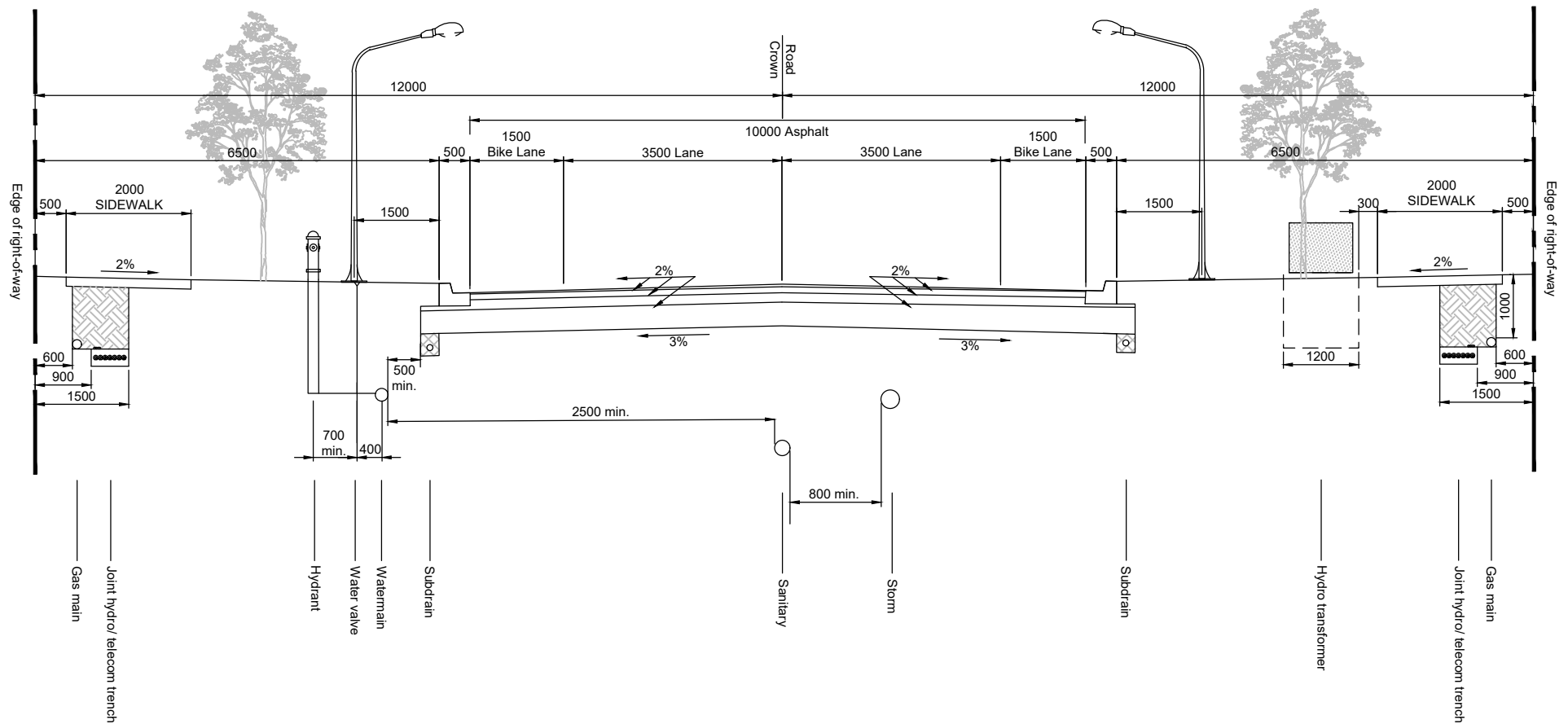
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**NOTES:**

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. WASTEWATER SYSTEMS, STORMWATER SYSTEMS, INCLUDING LOW IMPACT DEVELOPMENT FACILITIES, AND WATER DISTRIBUTION AND TRANSMISSION SYSTEMS TO BE DESIGNED IN ACCORDANCE WITH CITY OF BARRIE ENGINEERING GUIDELINES AND STANDARDS.
3. REFER TO THE CITY OF BARRIE ROADWAY ILLUMINATION POLICIES AND DESIGN GUIDELINES AND ASSOCIATED BSD'S FOR LIGHT STANDARD AND POLE BASE LOCATION AND DEPTH.
4. REFER TO TRANSPORTATION DESIGN MANUAL FOR PAVEMENT DESIGN METHODOLOGY.
5. TREES TO BE PLACED IN LOCATIONS APPROVED BY THE PARKS, PLANNING, AND DEVELOPMENT BRANCH. (SEE BSD-1315)



#### Notes:

1. All dimensions are millimetres unless otherwise shown.
2. Wastewater systems, stormwater systems including low impact development facilities, and water distribution and transmission systems to be designed in accordance with City of Barrie engineering guidelines and standards.
3. Refer to the City of Barrie Roadway Illumination Policies and Design Guidelines and associated BSDs for light standard and pole base location and depth.
4. Refer to the Transportation Design Manual for pavement design methodology.
5. Widening may be required at intersections to accommodate required turning lanes.
6. Trees to be placed in locations approved by Parks Planning and Development branch (see BSD-1315).



## 24.0 m Minor Collector Residential Road Allowance

REV No. DATE: Aug. 2019

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SCALE: N.T.S.

BSD-303

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